POWER SYSTEM ANALYSIS FOR SUMANDAK – PHASE 2 (SUPG-B) DEVELOPMENT PROJECT USING ERACS

By

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FINAL PROJECT REPORT

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CERTIFICATION OF APPROVAL

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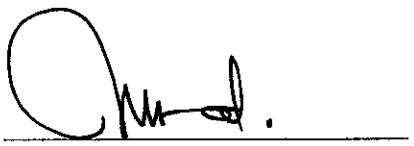
Approved:



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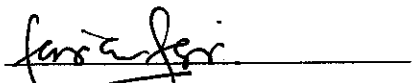
June 2007

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



Fauziana Binti Ahmad Fauzi

ABSTRACT

A power system analysis determines whether the proposed system upgrades, future upgrades and present distribution equipment will meet the present and future system requirements. This analysis includes research and evaluates the different voltage levels available from utility. Own generation may be considered in some cases. Thus, the objective of the project is to determine the performances of an electrical power system for an offshore platform, SUPG-B (Central Processing Platform). This project comprises of Load Flow Study and Short Circuit Study. The project involves two major parts, which are modeling and simulations of SUPG-B network for the above studies. The studies mentioned will be conducted through simulation by using a power system analysis tool, ERACS. Simulation is required in seeing the real situations on the platform and how it will run based on different scenarios. The use of ERACS helps to improve the simulation process by increasing the speed of simulation as well as its powerful graphical user interface.

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TABLE OF CONTENTS

LIST OF TABLES ix

LIST OF FIGURES x

LIST OF ABBREVIATIONS xi

CHAPTER 1 INTRODUCTION 1

1.1 Background of Study 1

1.1.1 Power System Analysis 1

1.1.2 SUMANDAK Phase 2 (SUPG-B) Project Development 2

1.2 Problem Statement 3

1.2.1 Problem Identification 3

1.2.2 Significant of the Scope 3

1.3 Objectives 4

1.4 The Relevancy of the Project 4

CHAPTER 2 LITERATURE REVIEW 5

2.1 SUPG-B Operation Philosophy 5

2.2 Power System Analysis 6

2.2.1 Load Flow Study 7

2.2.2 Short Circuit Study 8

2.3 Power System Modeling and Simulation 8

2.4 Simulation Tool 9

CHAPTER 3 METHODOLOGY / PROJECT WORK 10

3.1 Procedure Identification 10

3.2 Tool 10

CHAPTER 4 RESULTS AND DISCUSSIONS 12

4.1 Electrical Load Analysis 12

4.2 Modeling SUPG-B Network using ERACS 14

4.2.1 Power System Design 14

4.2.2 High Voltage Switchgear 14

4.2.3 Power Distribution Transformer 14

4.2.4 Low Voltage Switchboard 15

4.2.5 System Earthing 15

4.2.6 Design Fault Levels 15

4.2.7 Power System Configuration of SUPG-B 16
4.3 Simulation Studies 18
4.3.1 Load Flow Study 18
4.3.2 Short Circuit Study 22
CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS 26
5.1 Recommendations 26
REFERENCES 27
APPENDICES 28
Appendix A ELECTRICAL SINGLE LINE DIAGRAM OF SUPG-B 29
Appendix B ELECTRICAL LOAD ANALYSIS 30
Appendix C ERACS LOAD FLOW PRINTOUTS – SCENARIO 1 31
Appendix D ERACS LOAD FLOW PRINTOUTS – SCENARIO 2 32
Appendix E ERACS LOAD FLOW PRINTOUTS – SCENARIO 3 33
Appendix F ERACS SHORT CIRCUIT PRINTOUTS – SCENARIO 1 34
Appendix G ERACS SHORT CIRCUIT PRINTOUTS – SCENARIO 2 35
Appendix H ERACS LOAD FLOW PRINTOUTS – SCENARIO 3 36

LIST OF TABLES

Table 1 The summarized Load Analysis of SUPG-B.....13
Table 2 Scenario options for Load Flow Study.....19
Table 3 Operational Matrix.....19
Table 4 Summary of Load Flow Study for all scenarios.....20
Table 5 Analysis of the Load Flow Study for each scenarios.....21
Table 6 Scenario options for Short Circuit Study.....23
Table 7 Summary for Short Circuit Study for all scenarios.....24
Table 8 Analysis of the Short Circuit Study for each scenarios.....25

LIST OF FIGURES

Figure 1 SUMANDAK Development Project 2
Figure 2 Fundamentals of electrical systems 6
Figure 3 Load flow study 7
Figure 4 Short circuit study 8
Figure 5 Project Process Flow 11
Figure 6 SUPG-B Network 17
Figure 7 Load flow Parameters 18
Figure 8 Fault study setup 22

LIST OF ABBREVIATIONS

ACB	:	Air Circuit Breaker
ATS	:	Auto Transfer Switch
EDG	:	Emergency Diesel Generator
GTG	:	Gas Turbine Generator
IDMTL	:	Inverse Definite Minimum Time Lag (protection relay)
IM	:	Induction Motor
LQ	:	Living Quarter
MCC	:	Motor Control Centre
NC	:	Normally Closed
NO	:	Normally Open
RU	:	Relay Unit
SB	:	Switchboard
SG	:	Switchgear
SM	:	Synchronous Motor
TF	:	Transformer
VCB	:	Vacuum Circuit Breaker

CHAPTER 1
INTRODUCTION

1.1 Background of Study

1.1.1 Power System Analysis

Power system analysis deals with the fundamentals of electrical systems which focus on power generation, transmission, and distribution. The principles of circuit parameters concerning transmission lines, like inductance, capacitance, resistance, conductance, and admittance are given consideration. Conducting a good power system analysis is of great importance in planning and designing the future expansion of power systems as well as in determining the best operation of existing system. It has the main goal of providing continuous power supply to the facility with minimum interruptions. Therefore, it is necessary that electric power system is designed to be stable and protected under any conceivable disturbances.

The load flow study is an important tool involving numerical analysis applied to a power system. The principal information obtained from a load flow is the magnitude and phase angle of the voltage at each bus and the real and reactive power flowing in each line.

Short circuit study is performed to determine the maximum fault currents that would be present in the power system during a system disturbance. Under fault conditions, the protective devices would attempt to interrupt the fault current, which could cause a violent failure.

1.1.2 SUMANDAK Phase 2 (SUPG-B) Project Development

Phase 2 Development consists of Sumandak Selatan Processing Platform (SUPG-B), Sumandak Tepi Drilling Platform (SUJT-C), interfield pipelines and Host-Tie Ins. SUPG-B is designed as a 6 legged platform. It can accommodate 18 conductor slots and drilling will be done by tender assisted rig. This platform is developed as a modular concept which consist of 5 modules namely Power Generation-Mini LQ module, Water Injection module, Drilling module, Production module and Compression module.

The SUPG-B facilities will be designed such that it can be operated with minimum manpower without jeopardizing the flexibility and reliability of the operation, production availability and most importantly the safety integrity of the facilities. In addition, high production availability through the enhancement of the system maintenance capability without shutdown and through the use of equipment or devices with minimum maintenance requirements will always be the primary consideration in the design of the facilities.

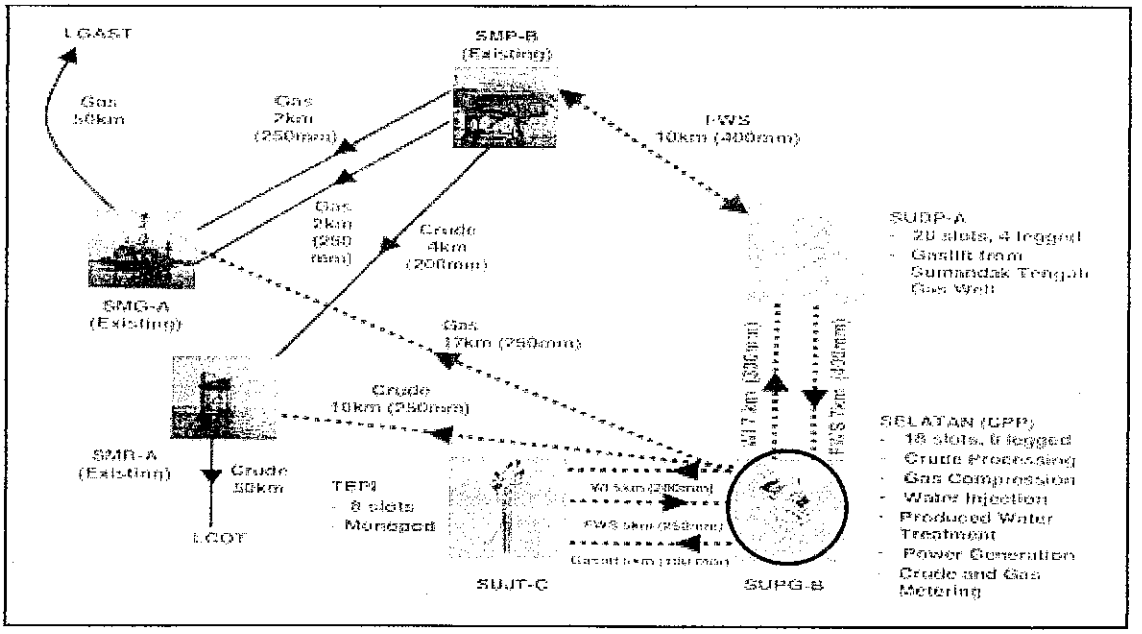


Figure 1 SUMANDAK Development Project

1.2 Problem Statement

1.2.1 Problem Identification

The oil and gas industry today is facing the major challenges of increased in safety and production whilst needing to develop cost effective means of reducing and managing emissions. An important factor in achieving these objectives is the effective application of power system analysis. For this purpose many calculations need to be done by the electrical engineer. In most cases, the manual methods of calculating the power system analysis are tedious and time consuming. To overcome this problem, a need of powerful software that provides various calculations and studies besides providing a mean to simulate the design of ones platform is necessity. Therefore, the modeling and simulations for Load Flow Study and Short Circuit Study will be conducted using ERACS.

1.2.2 Significant of the Scope

A well-designed power system is the backbone of all industrial and utility facilities. A good power system study provides the information necessary to upgrade and maintain the power delivery infrastructure of ones platform.

The modeling and simulation of power system is essential in determining the performances of the power system. "Modeling" refers to the process of analyzing the suitable mathematical description of the parameters of the components. "Simulations" involves the techniques to set up the model of real situations based on different scenarios.

Load Flow Study is conducted under normal steady state conditions at full load to determine the loading of electrical equipment such as generators, cables, violation of voltage, determine platform power factor and system losses.

Short Circuit Study is conducted to verify and establish the maximum prospective three phase symmetrical short circuit current at the busbar of the Switchgear and Motor Control Centre (MCC). The results obtained from the study is used to verify whether the existing busbar short circuit ratings are sufficient to withstand and interrupt the fault current and to allow new equipment for a specific offshore platform to be selected accordingly.

1.3 Objectives

The objectives of conducting a power system analysis are as the followings:

- To understand the importance of power system analysis for an offshore platform.
- To perform modeling and simulations of SUPG-B Network for the purpose of Load Flow Study and Short Circuit Study.
- To familiarize with the selected computer aided tool, ERACS in order to perform the power system analysis.

1.4 The Relevancy of the Project

The purpose of conducting a power system analysis is the ability to maintain an optimum power system that serves present and future plant operating needs. The power system analysis often includes a comprehensive review of the existing system with a clear understanding of future requirements. A key component of the analysis is the ability of the engineer to understand existing conditions, future needs and system capabilities. A combination of Load Flow Study and Short Circuit Study techniques are employed to complete the analysis.

Note: The load values are based on the data available as on date from Process, Mechanical, Instrumentation and Package Equipment Vendors.

CHAPTER 2
LITERATURE REVIEW

2.1 SUPG-B Operation Philosophy

Refer to APPENDIX A for the key overall single line drawing showing the overall power generation and distribution scheme of SUPG-B. SUPG-B Central Processing Platform is equipped with three (3) gas turbine generators (GT-7500, GT-7530 and GT-7560) with a 3 x 50% configuration.

For short circuit study, alternator rating of 4370kVA, 6600V, 0.8 p.f., 3 phase, 50Hz has been considered. During normal operation of the platform two (2) turbine generators shall be running in parallel. However, the electrical system shall be suitable for a condition that all three GT units are running in parallel. The turbine generators are connected to HV switchgear SG-7510. Motors rated 200kW and above are connected to this switchgear.

For the low voltage consumers, four (4) power transformers (TF-7510, TF-7520, TF-7530 and TF-7540), each rated 2MVA, 6600V/420V, AN, Dyn11 divided into two separate systems with 2x100% configuration are considered. The first system consists of power transformers TF-7510 and TF-7520 which are connected to Bus-A and Bus-B of SB-7710 respectively, whereas the other system consists of power transformers TF-7530 and TF-7540 are connected to Bus-C and Bus-D of SB-7720 respectively, while Bus-D is linked to the Bus-E of SB-7720 by means of Automatic Transfer Switch, ATS-7720 which is normally closed. During normal operation, the two transformers, TF-7510 feeds Bus-A and Bus-B, and TF-7530 feeds Bus-C and Bus-D/E independently. However, during transfer of loads for planned maintenance of one of the transformer, the associated bus-tie breakers of

the LV switchboard SB-7710 and SB-7720 will be closed momentary for parallel operation, prior to transferring the load.

For emergency and black start purpose, one (1) emergency diesel generator (G-7700) rated 1000kW, 400V, 0.8 p.f. 50Hz, 3 phase, 4 wire is installed. The emergency diesel generator is connected to ATS-7720. During normal operation of the platform the emergency generator shall not be running and ATS between Bus-D & Bus-E will be in 'closed' position. On detection of dead bus, Diesel Generator (G-7700) set will get started automatically and supplies to Bus D and Bus E of SB-7720. However, during transfer of load from emergency to normal, on load or during testing of Diesel Generator set, the emergency generator will be in parallel with main power using ATS. Synchronizing facility shall be provided between the diesel generator and main power supply.

2.2 Power System Analysis

Power System Analysis mainly deals with the fundamentals of electrical systems which focus on power generation, transmission, and distribution.

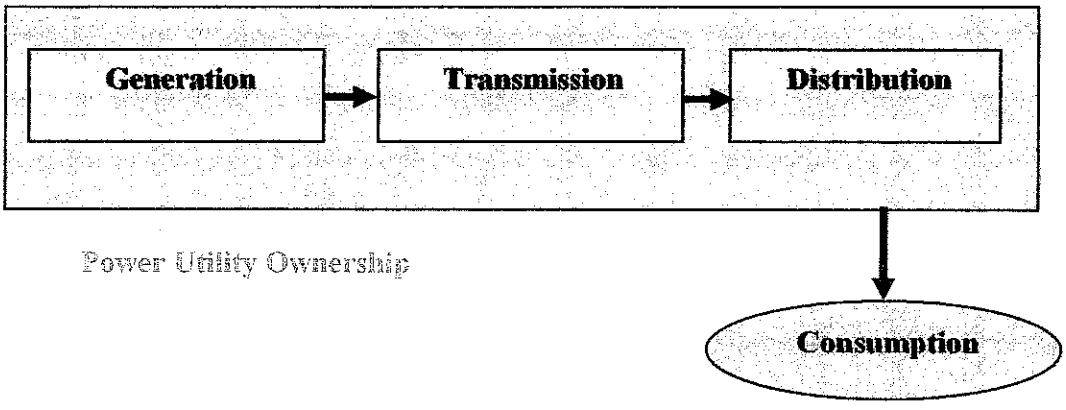


Figure 2 Fundamentals of electrical systems

2.2.1 Load Flow Study

Load Flow Study is especially valuable for a system which involves multiple load centers. The Load Flow Study is an analysis of the system's capability to adequately supply the connected load. The study will provide useful information about real and reactive power flow, bus voltages, and power factor in each branch of the system [6]. Other types of information can also be obtained in a Load Flow Study: optimum types and size for busbars, the possibility and extent of faults (overloads) on transformers, generators and tie-circuits during normal and emergency conditions

The Load Flow Study, like all system studies, usually is performed on a digital computer, which produces a printout that lists voltage, megawatt (MW), and megaVAR (MVAR) values at each bus location. The total system losses, as well as individual line losses, also are tabulated.

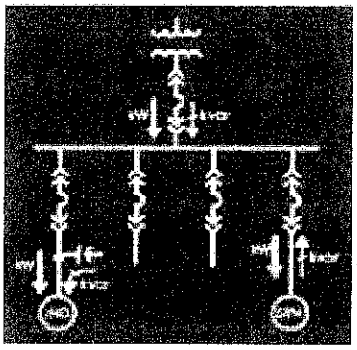


Figure 3 Load flow study

2.2.2 Short Circuit Study

Short-circuit fault in a power system is an abnormal condition that involves one or more phases unintentionally coming in contact with ground or each other. As plant expansion occurs, loads may be moved and larger ones added, leading to increased levels of available short circuit currents. The possibility of increasing the amount of short circuit current available into a fault by these changes is the major reason for a periodic system study [6].

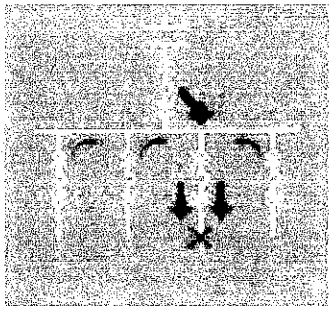


Figure 4 Short circuit study

2.3 Power System Modeling and Simulation

Power system is defined as the electric power distribution network or system of a utility or industrial plant. "Modeling" refers to the mathematical representation of various components of a power system such as generating units, transmission lines, buses, transformers, loads, machines, etc. The representation of the elements by means of appropriate mathematical model is critical to the successful analysis of the system performances. As for "Simulation" is defined as the generation of test(s) on a virtual-time basis to predict the behavior of the real systems. Using a computer, various scenarios that occur on the electrical power system can be simulate and analyze.

2.4 Simulation Tool

ERACS software is PC-based, fully integrated and has an easy to use interface. The ERACS programs are constantly providing many benefits in terms of reduced study times and improved technical capability to users. Thus, it meets the specific needs of engineers with practical problems to solve.

The following program modules and options are available in ERACS:

- Graphical user interface
- Load flow
- Fault (classical) & fault IEC909
- Harmonic injection & impedance
- Transient stability
- Protection co-ordination
- Universal dynamic modeler
- Stand alone or network versions
- 10, 150 and 1500 busbar versions

CHAPTER 3
METHODOLOGY / PROJECT WORK

3.1 Procedure Identification

Stage 1: Literature Research

The literature review conducted covers: studying the basic fundamentals of a power system analysis and familiarizing with the computer aided tool, ERACS.

Stage 2: Modeling SUPG-B Network

Data is gathered from other disciplines. It is important to obtain the accurate data since inaccuracy of the equipments rating could affect the electric power system of ones platform.

Stage 3: Simulation of Load Flow Study

To calculate the steady state conditions of the power system network. Under given constraints the program will determine the network voltage, current and real and reactive power flows

Stage 4: Simulation of Short Circuit Study

To establish the maximum prospective initial phase symmetrical and asymmetrical short circuit currents at the busbars of HV Switchgear, LV Switchboard, Transformers and all major and critical equipments.

3.2 Tool

Modeling and simulations using power system analysis software, ERACS.

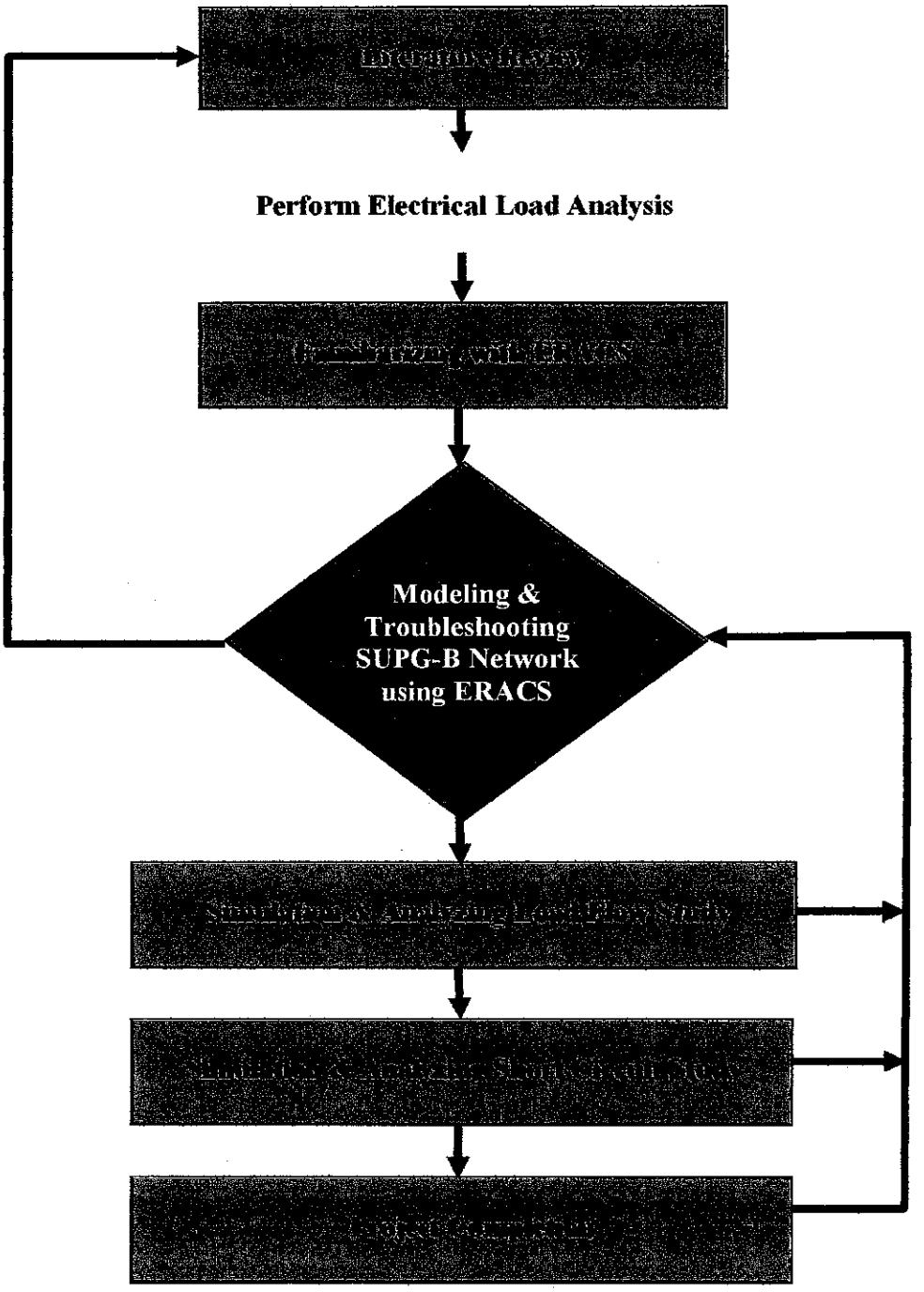


Figure 5 Project Process Flow

CHAPTER 4
RESULTS AND DISCUSSIONS

4.1 Electrical Load Analysis

Electrical load analysis is categorized as continuous, intermittent and standby load. The definitions of the above criteria are based on criticality of the equipment installed.

Continuous loads: All loads that are required to be operating continuously on the platform at normal operation mode. This is critical load which may jeopardise the process operation in case there is any electrical power outage or shutdown (e.g. wellhead control panel, instrumentation protection system panel, lighting and etc.)

Intermittent loads: All process and utility loads require for normal operation but neither operating simultaneously or continuously. The load will operate on the process demand or need as a supplementary to the duty unit in order to boost up the operational system.

Standby loads: All loads that are required when the duty (continuous) system are under maintenance program or during abnormal condition. Act as a replacement to the duty load.

The study on the Load Analysis will be presented based on several operation scenarios as follows:

Full Load Case

- 100% capacity of Water Injection System
- 100% capacity of Gas Compression System
- 100% capacity of oil production
- 100% capacity of Utility Air System
- 100% capacity of mini-LQ facilities.

Load Shedding Case

- 50% capacity of Water Injection System
- 50% capacity of Gas Compression System
- 100% capacity of oil production
- 100% capacity of Utility Air System
- 100% capacity of mini-LQ facilities.

Full Load Case (Low Voltage Loads for Emergency Diesel Generator

- 100% capacity of Utility Air System
- 100% capacity of mini-LQ facilities

The calculated results are summarized as follows:

Table 1 The summarized Load Analysis of SUPG-B

CASE	PEAK LOAD		
	kW	kVAR	kVA
Full Load	5,501.71	2,441.79	6,019.32
Load Shedding	3,468.71	1,518.39	3,787.56
Full Load (Low Voltage Loads for Emergency Diesel Generator)	853.19	504.78	991.33

For further reference kindly refer to the electrical load analysis provided in APPENDIX B.

4.2 Modeling SUPG-B Network using ERACS

The design of the electrical power generation and distribution systems shall be based on good engineering practice and internationally accepted national standards.

4.2.1 Power System Design

High Voltage System	-	6.6kV, 50Hz, 3 phase, 3-wire
Low Voltage System	-	400V, 50Hz, 3 phase + neutral, 4 wire

4.2.2 High Voltage Switchgear

The switchgear shall be suitable for operation in accordance with the following requirements:

Supply system	:	6.6 kV, 3 phase, 50 Hz, 3 wire
System fault level	:	25 kA (rms) for 3 seconds
Busbar rating	:	2000 A insulated bus bars
Neutral earthing	:	Resistance earth limited to 400 A (via generator star point)

4.2.3 Power Distribution Transformer

Transformers installed on SUPG-B shall be suitable for operation in accordance with the following requirements:

Primary system	:	6.6 kV, 3 phase, 50 Hz
System fault level	:	25 kA (rms) 3 seconds
Secondary system	:	400 V, 3 phase + neutral, 50 Hz
Rating	:	2000 kVA continuous
Neutral earthing	:	Solid
Impedance	:	6.25 %

4.2.4 Low Voltage Switchboard

The switchboard/MCC shall be suitable for operation in accordance with the following requirements:

Supply system	:	400 V, 3 phase + neutral, 50 Hz
System fault level	:	Refer to overall Single Line Diagram
Busbar rating	:	Refer to overall Single Line Diagram
Neutral earthing	:	Solidly earthed via transformer neutral

4.2.5 System Earthing

System Voltage	Earthing
6.6 kV	Resistance earthed at generator neutral
400V	Solidly earthed at transformer secondary star point

Low resistance grounding shall be used for the medium voltage (6.6kV) power system as it has the following advantages.

- Limited ground fault level in the power system
- Selective clearing of the ground fault.
- Avoid interruption and tripping of the power system.

Note: Transformers are solidly grounded to the platform structure at the transformer neutral at the secondary winding. While Emergency Diesel Generator is solidly grounded to the platform structure at the generator star point.

4.2.6 Design Fault Levels

The maximum design fault level shall be limited to following nominal values:

6.6kV System	-	25 kA 3 second
400V System	-	65 kA 1 second

4.2.7 Power System Configuration of SUPG-B

The designed and modeled of SUPG-B network is shown in Figure 6. SUPG-B Central Processing Platform is equipped with 3 gas turbine generators (GTG-1, GTG-2 and GTG-3) with a 3 x 50% configuration. The incoming voltage of 6.6kV is stepped down to 0.4kV through 4 power transformers: each rated 2MVA, 6600V/420V, AN, Dyn11 divided into two separate systems with 2x100% configuration. For emergency and black start purpose, 1 emergency diesel generator (EDG) rated 1000kW. The emergency diesel generator is connected to ATS. During normal operation of the platform the emergency generator shall not be running.

The 6.6kV (HV Switchgear) power system network consists of elements:

- Synchronous generator: 3 Gas Turbine Generator, 3.5MW site rated
- 2 Busbars: Bus-A and Bus-B (6.6kV, 3phase, 50Hz)
- Induction Motors: Seawater Injection Pumps (A, B & C) and Seawater Lift Pumps (A, B & C)
- 4 Transformer: 2 windings (Delta and Grounded Star)
- On load tap changer
- 1 Bus Section
- Neutral Earthing
- Switches/ Circuit Breakers and IDMTL Relays

The 0.4kV (LV Switchboard) power system network consists of elements:

- 6 Busbars: Bus-A, Bus-B, Bus-C, Bus-D & Bus-E
- Induction Motors: Compressor Trains, Glycol Reboiler/ Still Column, Fuel Gas Superheaters, Normal Process Loads, Mini Living Quarters (LQ) & Other Loads, Plant Vital Loads and Vital Mini LQ & Other Loads
- Switches/ Circuit Breakers and IDMTL Relays
- 4 Bus Sections

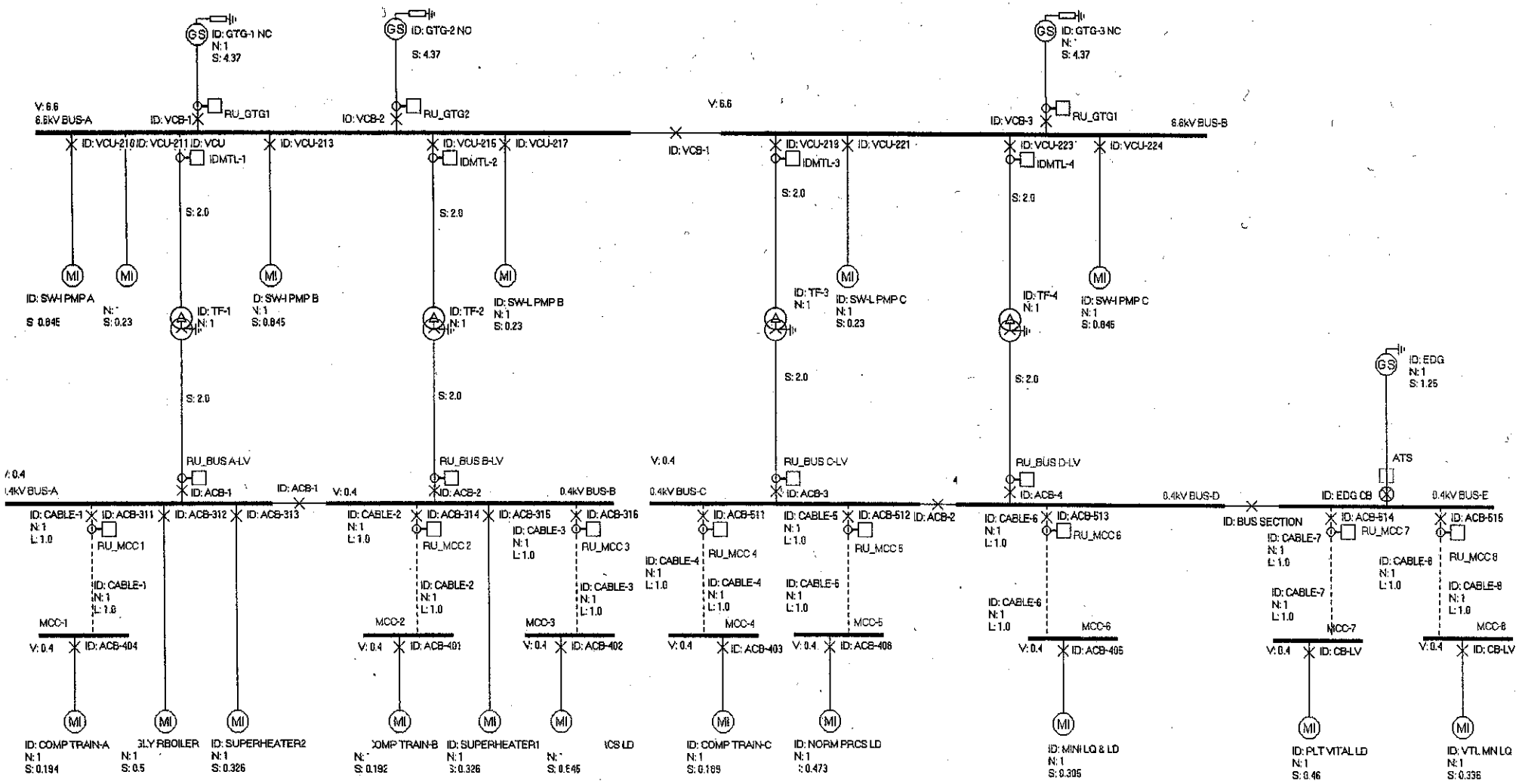


Figure 6 SUPG-B Network

4.3 Simulation Studies

4.3.1 Load Flow Study

Conducted under normal steady state conditions at full load to determine the loading of electrical equipment such as generators, cables, violation of voltage, determine platform power factor and system losses.

The aim of this study is to verify:

- The total power generation against the power demand of the platform
- Load flow characteristics in the whole electrical system
- For any current loading violations at any point in the system
- For any voltage violations at any bus in the system

Load Flow Parameters

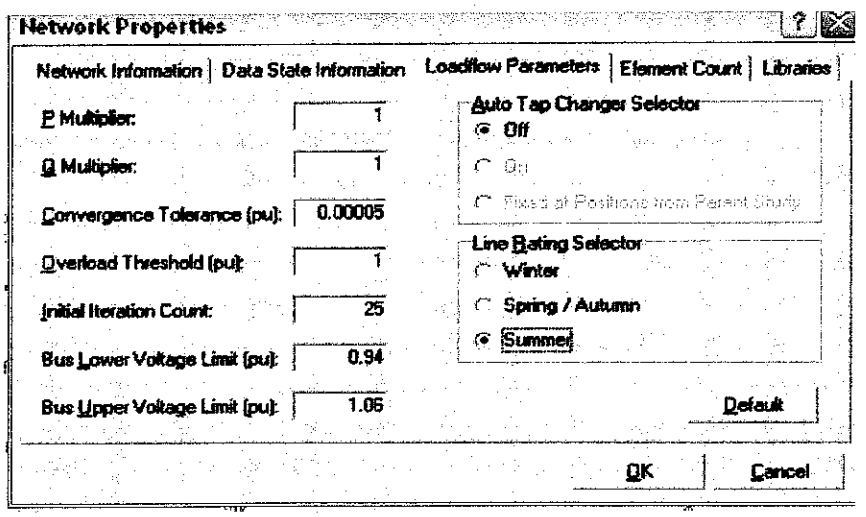


Figure 7 Load flow Parameters

Scenario Options

The scenarios considered for Load Flow Study are the same case as tabled out in the Short Circuit Study which is shown as below:

Table 2 Scenario options for Load Flow Study

Scenario	Description
1	2 turbine generators, GTG-1 & 3 are running, EDG is not running, only 2 transformers are in operation. all other bus sections are closed.
2	2 turbine generators, GTG-1 & 2 are running, EDG is not running, all transformers are in operation. all other bus sections are closed.
3	Only one turbine generator, GTG-1 is running, all transformers are in operation, bus sections to MCC-2 and SW-I PMP B are open, all other bus sections are closed.

Operational matrix

The operational matrix of the above scenario options is as follows:

Table 3 Operational Matrix

Scen.	GTG-1	GTG-2	GTG-3	TF-1	TF-2	TF-3	TF-4	VCB-1	ACB-1	ACB-2	EDG
1	X	O	X	X	O	X	O	X	X	X	O
2	X	X	O	X	X	X	X	X	X	X	O
3	X	O	O	X	X	X	X	X	X	X	O

X : Bus section Close / Generator Running

O : Bus section Open / Generator Stop

The following criteria are taken into consideration while selecting the short circuit level of the various buses:

- ATS is normally closed.
- EDG is not running.
- All bus sections are closed.

The modeled SUPG-B networks based on the scenarios selected are provided in APPENDIX C – E.

Results of the study

Refer to APPENDIX C to E for ERACS printouts representing all 3 scenarios and the normal operation. Below is the summarized results obtained for all three (3) scenario options:

Table 4 Summary of Load Flow Study for all scenarios

Scen.	PG (MW)	QG (MVAr)	PL (MW)	QL (MVAr)	PLO (MW)	QLO (MVAr)	I3Fmx (kA)	I3Fmn (kA)
1	4.281	2.641	4.25	2.396	0.031	0.245	34.591	9.668
2	4.265	2.532	4.25	2.415	0.015	0.117	51.892	9.877
3	3.475	2.072	3.462	1.969	0.013	0.103	43.4	5.638

PG : Total real power generation
QG : Total reactive power generation
PL : Real power at loads
QL : Reactive power at loads
PLO : Real power losses
QLO : Reactive power losses
I3Fmx : Maximum 3-phase fault level (kA)
I3Fmn : Minimum 3-phase fault level (kA)

Analysis of each scenario in accordance with the ERACS calculation results are tabulated as follows:

Table 5 Analysis of the Load Flow Study for each scenarios

Scen.	Analysis of Results	Remarks
1	- Total power generation is within the main power generator capacity - Load flow characteristics in the whole system are generally acceptable with no voltage violation found - Voltage drop at all terminals are below the allowable value.	This scenario reflects a normal operating condition and also a condition when the 2 transformers are taken out for service.
2	- Total power generation is within the main power generator capacity - Load flow characteristics in the whole system are generally acceptable with no voltage violation found - Voltage drop at all terminals are below the allowable value.	The scenario represents Full Load case whereby this actually reflects the normal operating scenario of the platform.
3	- Total power generation is within the main power generator capacity - Load flow characteristics in the whole system are generally acceptable with no voltage violation found - Voltage drop at all terminals are below the allowable value.	The scenario represents Load Shedding case whereby the operating scenario of the platform during emergency situation with only one GTG is able to run or the scenario during black start of the platform.

4.3.2 Short Circuit Study

To verify and establish the maximum prospective three phase symmetrical short circuit current at the busbar of the Switchgear and Motor Control Centre (MCC). The results obtained from the study is used to verify whether the existing busbar short circuit ratings are sufficient to withstand and interrupt the fault current and to allow new equipment for a specific offshore platform to be selected accordingly

Short Circuit Study Setup

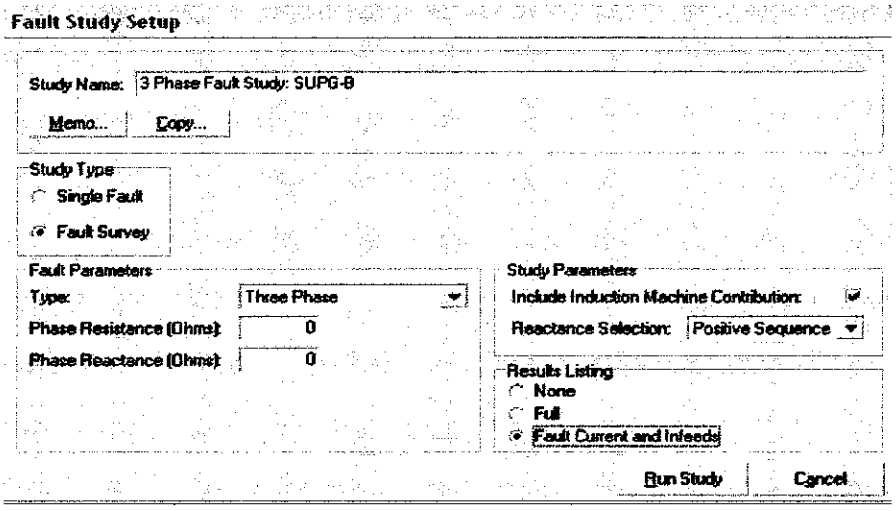


Figure 8 Fault study setup

Scenario Options

The scenarios considered for Short Circuit Study are the same case as tabled out in the Load Flow Study which is shown below:

Table 6 Scenario options for Short Circuit Study

Scenario	Description
1	2 turbine generators, GTG-1 & 3 are running, EDG is not running, only 2 transformers are in operation, all other bus sections are closed.
2	2 turbine generators, GTG-1 & 2 are running, EDG is not running, all transformers are in operation, all other bus sections are closed.
3	Only one turbine generator, GTG-1 is running, all transformers are in operation, bus sections to MCC-2 and SW-I PMP B are open, all other bus sections are closed.

Results of the study

Refer to APPENDIX F to H for ERACS printouts representing all 3 scenarios and the normal operation. The three phase fault current calculation figures from all scenarios are summarized and tabulated as following:

Table 7 Summary for Short Circuit Study for all scenarios

Item	Voltage	SCENARIO (kA)			Selected Rating (kA)
		1	2	3	
SUPERHEATER1	400	2.172	2.24	2.247	**25**
EDG Emergency Diesel Gen	400	-	-	-	**65**
GLYCOL REBOILER	400	3.335	3.439	3.45	**25**
GTG-1	6600	3.941	3.936	4.024	**25**
GTG-2	6600	-	3.936	-	**25**
GTG-3	6600	3.941	-	-	**25**
Compressor Train A	400	34.507	51.395	43.222	**65**
Compressor Train B	400	34.507	51.702	-	**65**
Mini LQ & Other Loads	400	33.395	50.579	43.275	**65**
Norm. Process Load – Bus B	400	34.518	51.72	43.236	**65**
Vital Mini LQ & Other Loads	400	33.396	50.551	43.276	**65**
Plant Vital Loads	400	33.4	50.557	43.281	**65**
Norm. Process Load – Bus C	400	33.401	50.557	43.281	**65**
0.4kV Switchboard (Bus A)	400	34.591	51.892	43.352	**65**
0.4kV Switchboard (Bus B)	400	34.591	51.892	43.352	**65**
0.4kV Switchboard (Bus C)	400	33.47	50.724	43.4	**65**
0.4kV Switchboard (Bus D)	400	33.47	50.724	43.4	**65**
0.4kV Switchboard (Bus E)	400	33.47	50.724	43.4	**65**
6.6kV Switchgear (Bus A)	6600	9.668	9.878	5.638	**25**
6.6kV Switchgear (Bus B)	6600	9.668	9.878	5.638	**25**

The analysis of the results shows that the calculated three phase fault currents for all scenarios are within the selected kA rating which are 25kA (3 seconds) for 6600V system and 65kA (1 second) for 400V system.

Analysis of each scenario is in accordance with the ERACS calculation results shown below:

Table 8 Analysis of the Short Circuit Study for each scenarios

Scen	Analysis of results	
1	The calculated three phase bolted fault currents are lower than the selected kA ratings of the equipment.	This scenario reflects a normal operating condition and also a condition when the 2 transformers are taken out for service.
2	The calculated three phase bolted fault currents are lower than the selected kA ratings of the equipment.	The scenario represents Full Load case whereby this actually reflects the normal operating scenario of the platform.
3	The calculated three phase bolted fault currents are lower than the selected kA ratings of the equipment.	The scenario represents Load Shedding case whereby the operating scenario of the platform during emergency situation with only one GTG is able to run or the scenario during black start of the platform.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

Load flow study is an important tool involving numerical analysis applied to a power system. The principal information obtained from a load flow is the magnitude and phase angle of the voltage at each bus and the real and reactive power flowing in each line. Short circuit study is performed to determine the maximum fault currents that would be present in the power system during a system disturbance. Based on the analysis of the results from Load Flow and Short Circuit Study for all scenarios; it is an indication that the use of 3 units of generators, with capacity of 3.5MW each by the configuration of 3x50% is able to meet the demand of total power loads on SUPG-B platform. Hence, the selected kA ratings (short circuit ratings) for the equipments are sufficient to withstand and interrupt the fault current.

5.1 Recommendations

Using other power system analysis software i.e. EDSA and SKM, the results of simulation can be compared. It will improve the accuracy of the results obtained.

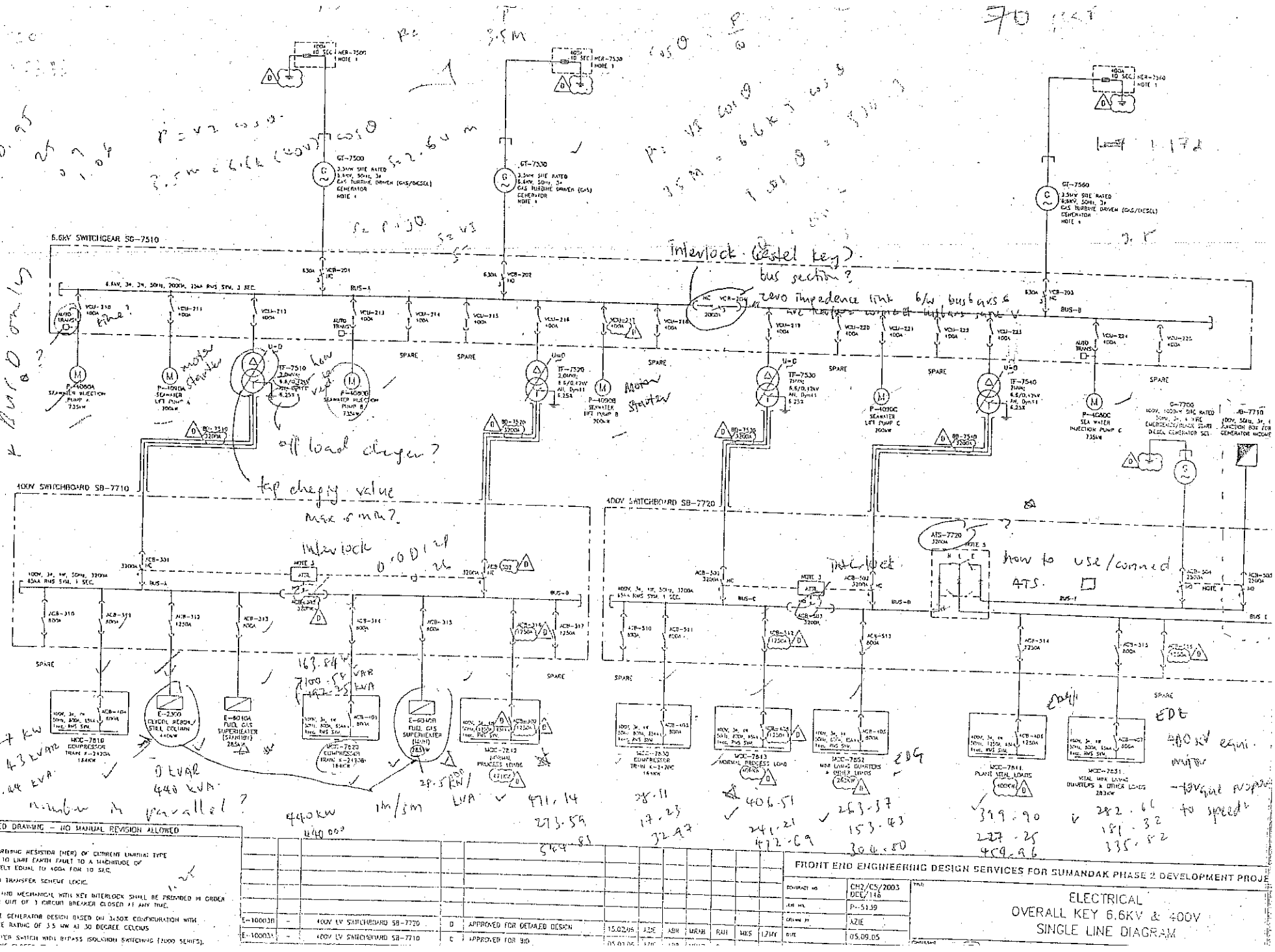
REFERENCES

1. PETRONAS Technical Standard Guidelines (PTS 33.64.10.10: Electrical Engineering Guidelines)
2. Load Flow Study for SUMANDAK Development Project (SUPG-B)
3. Hadi Saadat, 2004, Power System Analysis, Mc-Graw-Hill International Editions.
4. Computer Aided Power System Analysis, Ramasamy Natarajan, Dekker
5. Short Circuit Study for SUMANDAK Development Project (SUPG-B)
6. http://www.magnaelectric.com/content/view/25/39/
7. http://www.gepower.com/prod_serv/serv/industrial_service/en/pses/pss/loadflow_powfac.htm
8. http://www.gepower.com/prod_serv/serv/industrial_service/en/pses/pss/loadflow_powfac.htm
9. http://en.wikipedia.org/wiki/Load_flow_study

APPENDICES

APPENDIX A

ELECTRICAL SINGLE LINE DIAGRAM OF SUPG-B



CAD PRODUCED DRAWING – NO MANUAL REVISION ALLOWED

NOTES:

1. NEUTRAL EARTHING RESISTOR (NER) OF CURRENT LIMITING TYPE AND RATED TO LIMIT EARTH FAULT TO A MAGNITUDE OF APPROXIMATELY EQUAL TO 400A FOR 10 SEC.
2. ATSL : AUTO TRANSFER SCHEME LOGIC.
3. ELECTRICAL AND MECHANICAL KEY INTERLOCK SHALL BE PROVIDED IN ORDER TO ALLOW 2 OUT OF 3 CIRCUIT BREAKER CLOSED AT ANY TIME.
4. GAS TURBINE GENERATOR DESIGN BASED ON 3x50% CONFIGURATION WITH MINIMUM SITE RATING OF 3.5 MW AT 30 DEGREE CELCIUS
5. AUTO TRANSFER SWITCH WITH BYPASS ISOLATION SWITCHING (2000 SERIES).

E-10003H	–	400V LV SWITCHBOARD SB-7720	D	APPROVED FOR DETAILED DESIGN	15.02.05	AZIE	ABH	MRAH	RAH	MKS	IZMY
E-10003J	–	400V LV SWITCHBOARD SB-7710	C	APPROVED FOR BID	05.01.05	AZIE	ABH	MRAH	RAH	MKS	IZMY

FRONT END ENGINEERING DESIGN SERVICES FOR SUMANDAK PHASE 2 DEVELOPMENT PROJE

CONTRACT NO	CH2/CS/2003 DEC/148
JOB NO	P-5139
DRAWN BY	AZIE
DATE	05.09.05

ELECTRICAL
OVERALL KEY 6.6KV & 400V
SINGLE LINE DIAGRAM

APPENDIX B
ELECTRICAL LOAD ANALYSIS

SUPG-B FULL LOAD CASE (HIGH VOLTAGE LOADS)

	EQUIPMENT NO.	DESCRIPTION	V	E	NE	RS	C	INTT	STB	ABSORBED LOAD [A]	MOTOR RATING/ LOAD RATING [B]	LOAD FACTOR =A/B [C]	EFFICIENCY at load factor C [D]	POWER FACTOR at load factor C (a)	kW = A/D CONSUMED LOAD kVAr = kW * tan						VDIP	BUSBAR	TYPE	TY.DIA	REMARKS
															Continuous [E]		Intermittent and spares [F]		Stand-by [G]						
										kW	kW	in decimals	in decimals	cos. phi	kW	kVAr	kW	kVAr	kW	kVAr					
		6.6kV HV SWITCHGEAR LOADS SUMMARY																							
1	SW-L PMP A	SEA WATER LIFT PUMP - 1 (SUBMERSIBLE MOTOR)			X		X			190.00	200.00	0.95	0.95	0.87	200.00	113.35									
2	SW-L PMP B	SEA WATER LIFT PUMP - 2 (SUBMERSIBLE MOTOR)			X		X			190.00	200.00	0.95	0.95	0.87	200.00	113.35									
3	SW-L PMP C	SEA WATER LIFT PUMP - 3 (SUBMERSIBLE MOTOR)			X				X	190.00	200.00	0.95	0.95	0.87											
4	SW-I PMP A	SEA WATER INJECTION PUMP - 1			X		X			570.00	735.00	0.78	0.967	0.92	589.46	251.11			200.00	113.35					
5	SW-I PMP B	SEA WATER INJECTION PUMP - 2			X		X			570.00	735.00	0.78	0.967	0.92	589.46	251.11									
6	SW-I PMP C	SEA WATER INJECTION PUMP - 3			X				X	570.00	735.00	0.78	0.967	0.92					589.46	251.11					

Maximum of normal running plant load :

(Est. x % E + y % F **1,578.90** kW **728.90** kVAr **1739.03** kVA

x = 100 y = 30 or largest intermittent load

Peak load: **2,168.36** kW **980.01** kVAr **2379.53** kVA

(Est. x % E + y % F + z G)

x = 100 y = 30 z = 10% or largest standby load

Coincidence factors x, y and z shall be defined for each separate case, subject to principal's approval

TOTAL	1578.90	728.90	0.00	0.00	789.45	364.45
kVA=sqrt(kW ²+ kVAr²)	1739.03		0.00		869.52	

p.f. without compensation (cos. phi) :

p.f. with compensation (cos. phi1) :

Req'd capacitor rating[=kW(tan phi - tan phi1)]:

NOTES:

V - Vital E - Essential

NE - Non-esse RS - Restarting

a) Absorbed loads :
- for pumps, shaft load on duty point;
- for instrumentation, computers, communication, air conditioning, the required load during full operation of plant
- for lighting during dark hours;
- for workshops, the average total load in normal full operation.

b) Consumed Loads:

E - "Continuous" all loads that may continuously be required for normal operation, including lighting and workshops.

F - "Intermittent and spares" the loads required for intermediate pumping, storage, loading etc. all electrical spares of electrically driven units.

G - "Stand-by", loads required in emergencies only, such as fire-water pumps or those of normally not running electrically driven units stand-by for normally running steam-driven ones (e.g. charge pumps, boiler feed pumps).

VDIP : Protection against short-time voltage drop.

TYPE : CB = Circuit Breaker
C = Contactor
CBD = Circuit Breaker and Earth Leakage Relay

VVVF : Variable Voltage Variable Frequency

TY.DIA : Typical Diagram

EQUIPMENT NO.	DESCRIPTION	EQUIPMENT: V	E	NE	RS	C	INT	STB	ABSORBED LOAD [A] kW	MOTOR RATING/ LOAD RATING [B] kW	LOAD FACTOR =A/B [C] in decimals	EFFICIENCY at load factor C [D] in decimals	POWER FACTOR at load factor C (a) cos. phi	kW = A/D CONSUMED LOAD Continuous kW	Continuous kVAr	Intermittent and spares [E] kW	Intermittent and spares [E] kVAr	Stand-by [F] kW	Stand-by [F] kVAr	kVAr = kW * tan phi [G]	VDIP	BUSBAR	TYPE	TY-DIA	REMARKS
SB-7710	LV SWITCHBOARD BUS-A																								
E-3300	GLYCOL REBOILER / STILL COLUMN			X		X			440.00	440.00	1.00	1.00	1.00	440.00	0.00										
E-6640A	FUEL GAS SUPERHEATER			X		X			285.00	285.00	1.00	1.00	1.00	285.00	0.00										
MCC-7810	TURBO COMPRESSOR UNIT AUX. LOADS K-2420A																								
	DIRECT DRIVE AC START SYSTEM			X			X		55.00	55.00	1.00	0.93	0.86												
	AC PRE/POST LUBE OIL PUMP MOTOR			X		X			41.00	41.00	1.00	0.91	0.85			59.14	35.09								
E-2470A	LUBE OIL COOLER FAN # 1			X		X			15.00	15.00	1.00	0.91	0.85	45.05	27.92										
E-2470A	LUBE OIL COOLER FAN # 2			X				X	15.00	15.00	1.00	0.91	0.85	16.48	10.22										
	LUBE OIL TANK HEATER			X			X		25.00	25.00	1.00	0.91	0.85					16.48	10.22						
P-2490A	TC DIESEL FUEL PUMP			X		X			48.00	48.00	1.00	0.93	0.85			27.47	17.03								
	ENCLOSURE VENT FAN A			X		X			7.50	7.50	1.00	0.85	0.80	51.88	31.74										
	ENCLOSURE VENT FAN B			X				X	7.50	7.50	1.00	0.85	0.80	8.82	6.62										
WSO-7851	WELDING SOCKET OUTLET			X			X		45.00	45.00	1.00	0.93	0.86					8.82	6.62						
																48.39	28.71								
E-2430A	1ST STAGE AFTER COOLER FAN # 1			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										1st Stage Compr & Cooler Train A
E-2430A	1ST STAGE AFTER COOLER FAN # 2			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										1st Stage Compr & Cooler Train A
E-2460A	2ND STAGE AFTER COOLER FAN # 1			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										2nd Stage Compr & Cooler Train A
E-2460A	2ND STAGE AFTER COOLER FAN # 2			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										2nd Stage Compr & Cooler Train A
SB-7710	LV SWITCHBOARD BUS-B																								
E-6640B	FUEL GAS SUPERHEATER			X				X	285.00	285.00	1.00	1.00	1.00					285.00	0.00						
MCC-7820	TURBO COMPRESSOR UNIT AUX. LOADS K-2420B																								
	DIRECT DRIVE AC START SYSTEM			X			X		55.00	55.00	1.00	0.93	0.86												
	AC PRE/POST LUBE OIL PUMP MOTOR			X		X			41.00	41.00	1.00	0.94	0.85			59.14	35.09								
E-2470B	LUBE OIL COOLER FAN # 1			X		X			15.00	15.00	1.00	0.91	0.85	43.82	27.03										
E-2470B	LUBE OIL COOLER FAN # 2			X				X	15.00	15.00	1.00	0.91	0.85	16.48	10.22										
	LUBE OIL TANK HEATER			X			X		25.00	25.00	1.00	0.91	0.85					16.48	10.22						
P-2490B	TC DIESEL FUEL PUMP			X		X			48.00	48.00	1.00	0.93	0.86			27.47	17.03								
	ENCLOSURE VENT FAN A			X		X			7.50	7.50	1.00	0.85	0.80	51.88	30.78										
	ENCLOSURE VENT FAN B			X				X	7.50	7.50	1.00	0.85	0.80	8.82	6.62										
WSO-7852	WELDING SOCKET OUTLET			X			X		45.00	45.00	1.00	0.93	0.86					8.82	6.62						
																48.39	28.71								
E-2430B	1ST STAGE AFTER COOLER FAN # 1			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										1st Stage Compr & Cooler Train B
E-2430B	1ST STAGE AFTER COOLER FAN # 2			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										1st Stage Compr & Cooler Train B
E-2460B	2ND STAGE AFTER COOLER FAN # 1			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										2nd Stage Compr & Cooler Train B
E-2460B	2ND STAGE AFTER COOLER FAN # 2			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62										2nd Stage Compr & Cooler Train B
MCC-7842	NORMAL PROCESS LOADS																								
E-6910	FUEL GAS PREHEATER			X		X			21.00	21.00	1.00	1.00	1.00	21.00	0.00										
	HEATER CONTROL PANEL			X		X			0.80	0.80	1.00	1.00	1.00	0.80	0.00										Fuel Gas System
E-2300	GLYCOL STILL VENT CONDENSOR			X		X			10.00	10.00	1.00	0.85	0.80	11.76	8.82										
P-2380A	GLYCOL CIRCULATION PUMP			X		X			10.50	10.50	1.00	0.85	0.80	12.35	9.26										Glycol Regen Skid
P-2380B	GLYCOL CIRCULATION PUMP			X				X	10.50	10.50	1.00	0.85	0.80					12.35	9.26						
P-9510	GLYCOL MAKE UP PUMP			X			X		0.50	0.50	1.00	0.85	0.80			0.59	0.44								
P-9520	GLYCOL TRANSFER PUMP			X			X		1.10	1.10	1.00	0.85	0.80			1.29	0.97								Glycol Storage
P-9540	CHEMICAL INJECTION PUMP			X			X		0.01	0.25	0.04	0.85	0.80			0.01	0.01								Glycol Storage
																									Glycol Storage
S-4010A	SEA WATER COURSE FILTER			X			X		0.80	0.80	1.00	0.85	0.80			0.94	0.71								
S-4010B	SEA WATER COURSE FILTER			X				X	0.80	0.80	1.00	0.85	0.80					0.94	0.71						Sea Water Course Filter
K-4050A	AIR BLOWER			X			X		5.00	5.00	1.00	0.85	0.80			5.88	4.41								Sea Water Course Filter
K-4050B	AIR BLOWER			X				X	5.00	5.00	1.00	0.85	0.80					5.88	4.41						Sea Water Fine Filter
K-4055A	RECYCLE COMPRESSOR			X		X			45.00	45.00	1.00	0.93	0.86	48.39	28.71										Sea Water Fine Filter
K-4055B	RECYCLE COMPRESSOR			X				X	45.00	45.00	1.00	0.93	0.86					48.39	28.71						Nitrogen Regen System
E-4056	START UP HEATER			X		X			15.00	15.00	1.00	1.00	1.00	15.00	0.00										Nitrogen Regen System
																									Nitrogen Regen System
K-5135 A	AIR BLOWER			X		X			5.00	5.00	1.00	0.85	0.80	5.88	4.41										
K-5135 B	AIR BLOWER			X				X	5.00	5.00	1.00	0.85	0.80					5.88	4.41						Hypoclorinator System (Hold)
P-5130A	HYPOCLORITE DOSING PUMP			X		X			1.00	1.00	1.00	0.85	0.80	1.18	0.88										Hypoclorinator System (Hold)
																									Hypoclorinator System (Hold)

EQUIPMENT NO.	DESCRIPTION	V	E	NE	RS	C	INT	STB	ABSORBED LOAD [A]	MOTOR RATING/ LOAD RATING [B]	LOAD FACTOR =A/B [C]	EFFICIENCY at load factor C [D]	POWER FACTOR at load factor C (a)	kW = A/D CONSUMED LOAD kVAr = kW * tan phi Continuous [E]		Intermittent and spares [F]		Stand-by [G]		V D I P	B U S B A R	T Y P E	T Y D I A	REMARKS
									kW	kW	in decimals	in decimals	cos. phi	kW	kVAr	kW	kVAr	kW	kVAr					
P-5130B	HYPOCLORITE DOSING PUMP			X				X	1.00	1.00	1.00	0.85	0.80											
	HYPOCLORITE TRANSFORMER / RECTIFIER A			X		X			2.00	2.00	1.00	0.85	0.80	2.35	1.76			1.18	0.88					Hypoclorinator System (Hold)
	HYPOCLORITE TRANSFORMER / RECTIFIER B			X				X	2.00	2.00	1.00	0.85	0.80					2.35	1.76					Hypoclorinator System (Hold)
P-6802A	DEMULSIFIER INJECTION PUMP			X		X			0.05	0.25	0.20	0.85	0.80	0.08	0.04									Hypoclorinator System (Hold)
P-6802B	DEMULSIFIER INJECTION PUMP			X				X	0.05	0.25	0.20	0.85	0.80											
P-6803A	PORTABLE CHEMICAL TRANSFER PUMP			X				X	1.20	1.50	0.80	0.85	0.80					0.06	0.04					Demulsifier Injection System
P-6803B	PORTABLE CHEMICAL TRANSFER PUMP			X				X	1.20	1.50	0.80	0.85	0.80					1.41	1.06					Demulsifier Injection System
P-6806A	DEOILER INJECTION PUMP			X		X			0.04	0.25	0.18	0.85	0.80					1.41	1.06					Demulsifier Injection System
P-6806B	DEOILER INJECTION PUMP			X				X	0.04	0.25	0.18	0.85	0.80	0.05	0.04									Demulsifier Injection System
P-6848A	BIOCIDE INJECTION PUMP			X		X			0.04	0.25	0.16	0.85	0.80					0.05	0.04					Deoiler Injection System
P-6848B	BIOCIDE INJECTION PUMP			X				X	0.04	0.25	0.16	0.85	0.80	0.05	0.04									Deoiler Injection System
P-6862A	BIOCIDE INJECTION PUMP			X		X			0.04	0.25	0.16	0.85	0.80					0.05	0.04					Biocide Injection System
P-6862B	BIOCIDE INJECTION PUMP			X				X	0.04	0.25	0.16	0.85	0.80	0.05	0.04									Biocide Injection System
P-6810A	BIOCIDE A INJECTION PUMP			X		X			0.125	0.25	0.50	0.85	0.80	0.15	0.11			0.05	0.04					Biocide Injection System
P-6810B	BIOCIDE A INJECTION PUMP			X				X	0.125	0.25	0.50	0.85	0.80											C.I. for Water Injection System
P-6820A	BIOCIDE B INJECTION PUMP			X		X			0.125	0.25	0.50	0.85	0.80	0.15	0.11			0.15	0.11					C.I. for Water Injection System
P-6820B	BIOCIDE B INJECTION PUMP			X				X	0.125	0.25	0.50	0.85	0.80											C.I. for Water Injection System
P-6830A	CORROSION INHIBITOR INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.15	0.11					C.I. for Water Injection System
P-6830B	CORROSION INHIBITOR INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
P-6850A	FERRITIC SULPHATE INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.01	0.01					C.I. for Water Injection System
P-6850B	FERRITIC SULPHATE INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
P-6869A	POLYELECTROLYTE INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.01	0.01					C.I. for Water Injection System
P-6869B	POLYELECTROLYTE INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
P-6870A	ANTIFOAM INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.01	0.01					C.I. for Water Injection System
P-6870B	ANTIFOAM INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
P-6886A	OXYGEN SCAVENGER INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.01	0.01					C.I. for Water Injection System
P-6886B	OXYGEN SCAVENGER INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
P-6890A	METHANOL INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.01	0.01					C.I. for Water Injection System
P-6890B	METHANOL INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
M-6895A	POLYELECTROLYTE MIXER			X		X			0.37	0.25	1.48	0.85	0.80	0.44	0.33			0.01	0.01					C.I. for Water Injection System
M-6895B	POLYELECTROLYTE MIXER			X				X	0.37	0.25	1.48	0.85	0.80											
P-6840A	SCALE INHIBITOR INJECTION PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.44	0.33					
P-6840B	SCALE INHIBITOR INJECTION PUMP			X				X	0.01	0.25	0.04	0.85	0.80											C.I. for Water Injection System
P-6824A	TYPE A CONTINUOUS CORROSION INHIBITOR INJEC. PUMP			X		X			0.02	0.25	0.08	0.85	0.80	0.02	0.02			0.01	0.01					C.I. for Water Injection System
P-6824B	TYPE A CONTINUOUS CORROSION INHIBITOR INJEC. PUMP			X				X	0.02	0.25	0.08	0.85	0.80											Corrosion Inhibitor Injection System
P-6852	TYPE A BATCH CORROSION INHIBITOR INJEC. PUMP			X		X			0.01	0.25	0.04	0.85	0.80	0.01	0.01			0.02	0.02					Corrosion Inhibitor Injection System
P-6836A	TYPE B CONTINUOUS CORROSION INHIBITOR INJEC. PUMP			X		X			0.07	0.25	0.28	0.85	0.80	0.06	0.06									Corrosion Inhibitor Injection System
P-6836B	TYPE B CONTINUOUS CORROSION INHIBITOR INJEC. PUMP			X				X	0.07	0.25	0.28	0.85	0.80											Corrosion Inhibitor Injection System
P-6856	TYPE B BATCH CORROSION INHIBITOR INJEC. PUMP			X		X			0.02	0.25	0.08	0.85	0.80	0.02	0.02			0.08	0.06					Corrosion Inhibitor Injection System
P-6842A	SCALE INHIBITOR INJECTION PUMP			X		X			0.03	0.25	0.12	0.85	0.80	0.04	0.03									Corrosion Inhibitor Injection System
P-6842B	SCALE INHIBITOR INJECTION PUMP			X				X	0.03	0.25	0.12	0.85	0.80											Scale Inhibitor Injection System
A-5900	NITROGEN GENERATION SKID			X		X			12.00	12.00	1.00	0.85	0.85	14.12	8.75			0.04	0.03					Scale Inhibitor Injection System
P-6433	CLOSED DRAIN CAISSON PUMP			X		X			0.22	0.25	0.88	0.85	0.80	0.26	0.19									
P-6449	OPEN DRAIN CAISSON PUMP			X		X			0.22	0.25	0.88	0.85	0.80	0.26	0.19									
A-6419	MULTIPHASE FLOW METER			X		X			1.20	1.20	1.00	0.85	0.80	1.41	1.06									
A-6240A/B	LP GAS RECOVERY UNIT TRAIN A																							
K-6245A	LP GAS 1st/2nd STAGE COMPRESSOR			X		X			110.00	110.00	1.00	0.93	0.86	118.28	70.18									
E-6250A	LP GAS 1st STAGE DISCHARGE COOLER			X		X			10.00	10.00	1.00	0.85	0.80	11.76	8.82									LP Gas Recovery Unit Train A
E-6265A	LP GAS 2nd STAGE DISCHARGE COOLER			X		X			10.00	10.00	1.00	0.85	0.80	11.76	8.82									LP Gas Recovery Unit Train A
A-6240B	LP GAS RECOVERY UNIT TRAIN B																							LP Gas Recovery Unit Train A
K-6245A	LP GAS 1st/2nd STAGE COMPRESSOR			X		X			110.00	110.00	1.00	0.93	0.86	118.28	70.18									
E-6250A	LP GAS 1st STAGE DISCHARGE COOLER			X		X			10.00	10.00	1.00	0.85	0.80	11.76	8.82									LP Gas Recovery Unit Train B
E-6265A	LP GAS 2nd STAGE DISCHARGE COOLER			X		X			10.00	10.00	1.00	0.85	0.80	11.76	8.82									LP Gas Recovery Unit Train B
P-6760	WELLHEAD EQUILIZATION PUMP			X				X	25.00	25.00	1.00	0.91	0.85											LP Gas Recovery Unit Train B
	WELLHEAD CONTROL PANEL		X			X			2.50	2.50	1.00	0.85	0.80	2.94	2.21									
B-7311	ELECTRIC DRIVEN MONORAIL - 15 MT			X				X	15.00	15.00	1.00	0.91	0.85			16.48	10.22							Diesel day Tank & Distribution
B-7351	ELECTRIC DRIVEN MONORAIL - 15 MT			X				X	15.00	15.00	1.00	0.91	0.85			16.48	10.22							
B-7352	ELECTRIC DRIVEN MONORAIL - 15 MT			X				X	15.00	15.00	1.00	0.91	0.85			16.48	10.22							
B-7353	ELECTRIC DRIVEN MONORAIL - 15 MT			X				X	15.00	15.00	1.00	0.91	0.85			16.48	10.22							
B-7354	ELECTRIC DRIVEN MONORAIL - 15 MT			X				X	15.00	15.00	1.00	0.91	0.85			16.48	10.22							
B-7355	ELECTRIC DRIVEN MONORAIL - 15 MT			X				X	15.00	15.00	1.00	0.91	0.85			16.48	10.22							

EQUIPMENT NO.	DESCRIPTION	V	E	NE	RS	C	INT	STB	ABSORBED LOAD [A] kW	MOTOR RATING/ LOAD RATING [B] kW	LOAD FACTOR =A/B [C] in decimals	EFFICIENCY at load factor C [D] in decimals	POWER FACTOR at load factor C (a) cos. phi	kW = A/D CONSUMED LOAD kVAr = kW * tan phi Continuous [E] kW	Continuous [E] kVAr	Intermittent and spares [F] kW	Intermittent and spares [F] kVAr	Stand-by [G] kW	Stand-by [G] kVAr	VDIP	BUSBAR	TYPE	TY.DIA	REMARKS
SB-7720	LV SWITCHBOARD BUS-C																							
MCC-7830	TURBO COMPRESSOR UNIT AUX. LOADS K-2420C																							
	DIRECT DRIVE AC START SYSTEM			X				X	55.00	55.00	1.00	0.93	0.86											
	AC PRE/POST LUBE OIL PUMP MOTOR			X				X	41.00	41.00	1.00	0.94	0.85					59.14	35.09					
E-2470C	LUBE OIL COOLER FAN # 1			X				X	15.00	15.00	1.00	0.91	0.85					43.82	27.03					
E-2470C	LUBE OIL COOLER FAN # 2			X				X	15.00	15.00	1.00	0.91	0.85					16.48	10.22					
	LUBE OIL TANK HEATER			X				X	25.00	25.00	1.00	0.91	0.85					16.48	10.22					
P-2490C	TC DIESEL FUEL PUMP			X				X	48.00	48.00	1.00	0.93	0.86					27.47	17.03					
	ENCLOSURE VENT FAN A			X				X	7.50	7.50	1.00	0.85	0.80					51.88	30.78					
	ENCLOSURE VENT FAN B			X				X	7.50	7.50	1.00	0.85	0.80					8.62	6.62					
WSO-7853	WELDING SOCKET OUTLET			X				X	45.00	45.00	1.00	0.93	0.86					8.62	6.62					
																		46.39	26.71					
E-2430C	1ST STAGE AFTER COOLER FAN # 1			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62									
E-2430C	1ST STAGE AFTER COOLER FAN # 2			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62									1st Stage Compr & Cooler Train C
E-2460C	2ND STAGE AFTER COOLER FAN # 1			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62									1st Stage Compr & Cooler Train C
E-2460C	2ND STAGE AFTER COOLER FAN # 2			X		X			20.00	26.00	0.77	0.91	0.85	21.98	13.62									2nd Stage Compr & Cooler Train C
																								2nd Stage Compr & Cooler Train C
MCC-7843	NORMAL PORCESS LOAD																							
P-1320A	CRUDE OIL TRANSFER PUMP - 1			X		X			131.00	150.00	0.87	0.95	0.86	137.89	81.82									
P-1320B	CRUDE OIL TRANSFER PUMP - 2			X		X			131.00	150.00	0.87	0.95	0.86	137.89	81.82									
P-1320C	CRUDE OIL TRANSFER PUMP - 3			X				X	131.00	150.00	0.87	0.95	0.86	137.89	81.82									
																		137.89	81.82					
WSO-7811	WELDING SOCKET OUTLET (MOD.1)			X			X		37.50	37.50	1.00	0.93	0.86											
WSO-7812	WELDING SOCKET OUTLET (MOD.1)			X			X		37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7813	WELDING SOCKET OUTLET (MOD.1)			X				X	37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7821	WELDING SOCKET OUTLET (MOD.2)			X			X		37.50	37.50	1.00	0.93	0.86					40.32	23.93					
WSO-7822	WELDING SOCKET OUTLET (MOD.2)			X			X		37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7831	WELDING SOCKET OUTLET (MOD.3)			X			X		37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7841	WELDING SOCKET OUTLET (MOD.4)			X			X		37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7842	WELDING SOCKET OUTLET (MOD.4)			X			X		37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7843	WELDING SOCKET OUTLET (MOD.4)			X				X	37.50	37.50	1.00	0.93	0.86			40.32	23.93							
WSO-7871	WELDING SOCKET OUTLET (MOD.7)			X			X		37.50	37.50	1.00	0.93	0.86					40.32	23.93					
WSO-7872	WELDING SOCKET OUTLET (MOD.7)			X			X		37.50	37.50	1.00	0.93	0.86			40.32	23.93							
																40.32	23.93							
SB-7720	LV SWITCHBOARD BUS-D																							
MCC-7852	MINI LIVING QUARTERS, HVAC & OTHER LOADS																							
F1A-1A	EXHAUST FAN (KITCHEN)		X			X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F1A-1B	EXHAUST FAN (KITCHEN)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F1A-2A	EXHAUST FAN (LAUNDRY/TOILETS)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F1A-2B	EXHAUST FAN (LAUNDRY/TOILETS)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F1A-3A	EXHAUST FAN (WORKSHOP)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F1A-3B	EXHAUST FAN (WORKSHOP)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F1A-4A	EXHAUST FAN (BATTERY ROOM)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F1A-4B	EXHAUST FAN (BATTERY ROOM)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F2-1A	EXHAUST FAN (UPS ROOM)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F2-1B	EXHAUST FAN (UPS ROOM)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F2-2A	EXHAUST FAN (SWITCHGEAR ROOM)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F2-2B	EXHAUST FAN (SWITCHGEAR ROOM)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F3-2A	EXHAUST FAN (MODULE EQUIPMENT ROOM)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F3-2B	EXHAUST FAN (MODULE EQUIPMENT ROOM)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F4-1A	FRESH AIR FAN (WATER INJECTION LAB)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F4-1B	FRESH AIR FAN (WATER INJECTION LAB)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
F4-2A	EXHAUST AIR FAN (WATER INJECTION LAB)	X				X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F4-2B	EXHAUST AIR FAN (WATER INJECTION LAB)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
ACCU-L1-1A	AIR COOLED CONDENSING UNIT (CENTRAL CONTROL ROOM)	X				X			50.00	50.00	1.00	0.93	0.86	53.76	31.90									
ACCU-L1-1B	AIR COOLED CONDENSING UNIT (CENTRAL CONTROL ROOM)			X				X	50.00	50.00	1.00	0.93	0.86					53.76	31.90					
ACCU-M-1A	AIR COOLED CONDENSING UNIT (SWITCHGEAR ROOM)	X				X			50.00	50.00	1.00	0.93	0.86	53.76	31.90									
ACCU-M-1B	AIR COOLED CONDENSING UNIT (SWITCHGEAR ROOM)			X				X	50.00	50.00	1.00	0.93	0.86					53.76	31.90					
ACCU-M-2A	AIR COOLED CONDENSING UNIT (MODULE EQUIPMENT ROOM)	X				X			15.00	15.00	1.00	0.91	0.85	16.48	10.22									
ACCU-M-2B	AIR COOLED CONDENSING UNIT (MODULE EQUIPMENT ROOM)			X				X	15.00	15.00	1.00	0.91	0.85					16.48	10.22					
ACCU-M-3A	AIR COOLED CONDENSING UNIT (WATER INJECTION LAB)	X				X			2.00	2.00	1.00	0.85	0.80	2.35	1.76									
ACCU-M-3B	AIR COOLED CONDENSING UNIT (WATER INJECTION LAB)			X				X	2.00	2.00	1.00	0.85	0.80					2.35	1.76					
F1-1A	PRESSURIZATION FAN (CENTRAL CONTROL ROOM)	X				X			4.00	4.00	1.00	0.85	0.80	4.71	3.53									

Peak Loads

EQUIPMENT NO.	DESCRIPTION	EQUIPMENT V	E	NE	RS	C	INT	STB	ABSORBED LOAD [A]	MOTOR RATING/ LOAD RATING [B]	LOAD FACTOR =A/B [C]	EFFICIENCY at load factor C [D]	POWER FACTOR at load factor C (a)	kW = A/D CONSUMED LOAD kVAr = kW * tan phi Continuous [E]		Intermittent and spares [F]		Stand-by [G]		V D C P	B U S B A R	T Y P E	T Y . D I A	REMARKS
									kW	kW	in decimals	in decimals	cos. phi	kW	kVAr	kW	kVAr	kW	kVAr					
F1-1B	PRESSURIZATION FAN (CENTRAL CONTROL ROOM)			X				X	4.00	4.00	1.00	0.85	0.80					4.71	3.53					
F2-1A	PRESSURIZATION FAN (SWITCHGEAR ROOM)		X			X			4.00	4.00	1.00	0.85	0.80	4.71	3.53									
F2-1B	PRESSURIZATION FAN (SWITCHGEAR ROOM)			X				X	4.00	4.00	1.00	0.85	0.80					4.71	3.53					
F3-1A	PRESSURIZATION FAN(MODULE EQUIPMENT ROOM)		X			X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
F3-1B	PRESSURIZATION FAN (MODULE EQUIPMENT ROOM)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
	PRESSURIZATION FAN (WATER INJECTION LAB)		X			X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
	PRESSURIZATION FAN (WATER INJECTION LAB)			X				X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
AHU-L1-1A	AIR HANDLING UNIT (CENTRAL CONTROL ROOM)		X			X			20.00	20.00	1.00	0.91	0.85	21.98	13.62									
AHU-L1-1B	AIR HANDLING UNIT (CENTRAL CONTROL ROOM)			X				X	20.00	20.00	1.00	0.91	0.85					21.98	13.62					
AHU-M-1A	AIR HANDLING UNIT (SWITCHGEAR ROOM)		X			X			25.00	25.00	1.00	0.91	0.85	27.47	17.03									
AHU-M-1B	AIR HANDLING UNIT (SWITCHGEAR ROOM)			X				X	25.00	25.00	1.00	0.91	0.85					27.47	17.03					
AHU-M-2A	AIR HANDLING UNIT (MODULE EQUIPMENT ROOM)		X			X			1.00	1.00	1.00	0.85	0.80	1.18	0.88									
AHU-M-2B	AIR HANDLING UNIT (MODULE EQUIPMENT ROOM)		X					X	1.00	1.00	1.00	0.85	0.80					1.18	0.88					
	STAND ALONE UNIT (WATER INJECTION LAB)		X			X			2.00	2.00	1.00	0.85	0.80	2.35	1.76									
	STAND ALONE UNIT (WATER INJECTION LAB)		X					X	2.00	2.00	1.00	0.85	0.80					2.35	1.76					
7PN-428	THYRISTOR PANEL (MODULE EQUIPMENT ROOM)		X			X			6.00	6.00	1.00	0.85	0.80	7.06	5.29									
7PN-427	THYRISTOR PANEL (SWITCHGEAR ROOM)		X			X			4.00	4.00	1.00	0.85	0.80	4.71	3.53									
7PN-426	THYRISTOR PANEL (CENTRAL CONTROL ROOM)		X			X			4.00	4.00	1.00	0.85	0.80	4.71	3.53									
	ELECTRIC DUCT HEATER #1			X		X			8.00	8.00	1.00	1.00	1.00	8.00	0.00									
	ELECTRIC DUCT HEATER #2			X		X			8.00	8.00	1.00	1.00	1.00	8.00	0.00									
	WATER HEATER #1			X		X			5.00	5.00	1.00	1.00	1.00	5.00	0.00									
	WATER HEATER #2			X				X	5.00	5.00	1.00	1.00	1.00					5.00	0.00					
	KITCHEN FACILITIES			X			X		5.00	5.00	1.00	0.85	0.80			5.88	4.41							
	LAUNDRY FACILITIES			X			X		5.00	5.00	1.00	0.85	0.80			5.88	4.41							
	SURVIVAL CRAFT	X						X	19.00	19.00	1.00	0.91	0.85					20.89	12.94					
SB-7720	LV SWITCHBOARD BUS-E																							
MCC-7841	PLANT VITAL LOADS																							
	TURBINE GENERATOR AUX. LOADS GT-7500																							
	STARTER MOTOR		X				X		90.00	90.00	1.00	0.93	0.88			96.77	57.42							
	LUBRICATING OIL PUMP MOTOR		X				X		5.50	5.50	1.00	0.85	0.80			6.47	4.85							
	LIQUID FUEL PUMP MOTOR		X				X		11.00	11.00	1.00	0.85	0.85			12.94	8.02							
	TURBINE ENCLOSURE VENT FAN MOTOR		X			X			22.00	22.00	1.00	0.91	0.85	24.18	14.98									
	LUBRICATING OIL TANK HEATER		X					X	2.40	2.40	1.00	0.85	0.80					2.82	2.12					
	GENERATOR BOOST FAN MOTOR		X			X			11.00	11.00	1.00	0.85	0.85	12.94	8.02									
	AIR BLAST OIL COOLER FAN MOTOR		X			X			5.50	5.50	1.00	0.85	0.80	6.47	4.85									
	BATTERY CHARGER		X			X			5.50	5.50	1.00	0.85	0.80	6.47	4.85									
	WATER WASH		X				X		10.00	10.00	1.00	0.85	0.80			11.76	8.82							
	TURBINE GENERATOR AUX. LOADS GT-7530																							
	STARTER MOTOR		X				X		90.00	90.00	1.00	0.93	0.88			96.77	57.42							
	LUBRICATING OIL PUMP MOTOR		X				X		5.50	5.50	1.00	0.85	0.80			6.47	4.85							
	LIQUID FUEL PUMP MOTOR		X				X		11.00	11.00	1.00	0.85	0.85			12.94	8.02							
	TURBINE ENCLOSURE VENT FAN MOTOR		X			X			22.00	22.00	1.00	0.91	0.85	24.18	14.98									
	LUBRICATING OIL TANK HEATER		X					X	2.40	2.40	1.00	0.85	0.80					2.82	2.12					
	GENERATOR BOOST FAN MOTOR		X			X			11.00	11.00	1.00	0.85	0.85	12.94	8.02									
	AIR BLAST OIL COOLER FAN MOTOR		X			X			5.50	5.50	1.00	0.85	0.80	6.47	4.85									
	BATTERY CHARGER		X			X			5.50	5.50	1.00	0.85	0.80	6.47	4.85									
	WATER WASH		X				X		10.00	10.00	1.00	0.85	0.80			11.76	8.82							
UPS-7814A	400V AC UPS LOADS - A (TELECOMM)	X				X			7.80	14.00	0.56	0.95	0.95	8.21	2.70									
UPS-7814A	400V AC UPS LOADS - B (TELECOMM)	X						X	7.80	14.00	0.56	0.95	0.95					8.21	2.70					
UPS-7814B	400V AC UPS LOADS - A (INST.)	X				X			43.80	57.00	0.77	0.95	0.96	46.11	15.15									
UPS-7814B	400V AC UPS LOADS - B (INST.)	X						X	43.80	57.00	0.77	0.95	0.95					46.11	15.15					
DU-7912	110V DC UPS LOADS (MAIN)	X				X			12.00	14.00	0.86	0.95	0.95	12.63	4.15									
K-5410A	AIR COMPRESSOR PACKAGE		X			X			133.00	133.00	1.00	0.93	0.86	143.01	84.86									
E-5410A	AIR COMPRESSOR COOLER FAN		X			X			6.00	6.00	1.00	0.85	0.80	7.06	5.29									
MCC-7851	MINI LIVING QUARTERS & OTHER VITAL LOADS																							
P-5720A	DIESEL TRANSFER PUMP		X			X			2.40	2.40	1.00	0.85	0.80	2.82	2.12									Diesel Day Tank & Distri
P-5720B	DIESEL TRANSFER PUMP			X				X	2.40	2.40	1.00	0.85	0.80					2.82	2.12					
A-5740	DIESEL CENTRIFUGE PACKAGE		X			X			1.30	1.30	1.00	0.85	0.80	1.53	1.15									Diesel Centrifuge System
	DIESEL CENTRIFUGE PACKAGE - PUMP 1		X					X	1.30	1.30	1.00	0.85	0.80					1.53	1.15					
	DIESEL CENTRIFUGE PACKAGE - PUMP 2																							

Peak Loads

EQUIPMENT

EQUIPMENT NO.	DESCRIPTION	V	E	NE	RS	C	INTT	STB	ABSORBED LOAD [A]	MOTOR RATING/ LOAD RATING [B]	LOAD FACTOR =A/B [C]	EFFICIENCY at load factor C [D]	POWER FACTOR at load factor C (a)	kW = A/D CONSUMED LOAD kVAr = kW * tan phi Continuous [E]		Intermittent and spares [F]		Stand-by [G]		VDIP	BUSBAR	TYPE	TY. DIA	REMARKS
									kW	kW	in decimals	in decimals	cos. phi	kW	kVAr	kW	kVAr	kW	kVAr					
	DIESEL CENTRIFUGE PACKAGE - PUMP 3		X			X			1.30	1.30	1.00	0.85	0.60											
	DIESEL CENTRIFUGE PACKAGE - PUMP 4		X					X	1.30	1.30	1.00	0.85	0.60	1.83	1.15									
A-5410B	AIR COMPRESSOR PACKAGE		X				X		133.00	133.00	1.00	0.93	0.86					1.53	1.15					
	AIR COMPRESSOR COOLER FAN		X				X		6.00	6.00	1.00	0.85	0.80			143.01	84.86							
A-5220A	POTABLE WATER MAKER															7.06	5.29							
	ELECTRIC HEATER		X			X			20.00	20.00	1.00	0.91	0.85	21.98	13.62									Potable Water System
	BRIEN CIRC. PUMP		X			X			1.20	1.50	0.80	0.85	0.80	1.41	1.06									
	COMPRESSOR		X			X			27.00	30.00	0.90	0.91	0.85	29.67	18.39									
	DISTILLATE PUMP		X			X			0.60	1.10	0.55	0.85	0.80	0.71	0.53									
	DISTILLATE BOOSTER PUMP		X			X			0.60	1.10	0.55	0.85	0.80	0.71	0.53									
	BRINE DISCHARGE PUMP		X			X			0.60	1.10	0.55	0.85	0.80	0.71	0.53									
	NADCI DOSING PUMP		X			X			0.02	0.25	0.06	0.85	0.60	0.02	0.01									
	NADCI DOSING PUMP		X			X			0.02	0.25	0.06	0.85	0.60	0.02	0.01									
A-5220B	POTABLE WATER MAKER																							
	ELECTRIC HEATER		X					X	20.00	20.00	1.00	0.91	0.85					21.98	13.62					Potable Water System
	BRIEN CIRC. PUMP		X					X	1.20	1.50	0.80	0.85	0.80					1.41	1.06					
	COMPRESSOR		X					X	27.00	30.00	0.90	0.91	0.85					29.67	18.39					
	DISTILLATE PUMP		X					X	0.60	1.10	0.55	0.85	0.80					0.71	0.53					
	DISTILLATE BOOSTER PUMP		X					X	0.60	1.10	0.55	0.85	0.80					0.71	0.53					
	BRINE DISCHARGE PUMP		X					X	0.60	1.10	0.55	0.85	0.80					0.71	0.53					
	NADCI DOSING PUMP		X					X	0.02	0.25	0.06	0.85	0.80					0.02	0.01					
	NADCI DOSING PUMP		X					X	0.02	0.25	0.06	0.85	0.80					0.02	0.01					
P-5210A	POTABLE WATER PUMP		X					X	2.13	3.00	0.71	0.85	0.80					2.51	1.88					Potable Water System
P-5210B	POTABLE WATER PUMP			X				X	2.13	3.00	0.71	0.85	0.80					2.51	1.88					Potable Water System
P-5160	WASH WATER PUMP			X		X			7.16	8.00	0.90	0.85	0.80	6.42	6.32									
A-5230	UV STERLIZER		X			X			10.00	10.00	1.00	0.85	0.80	11.76	8.82									
SD-7300	PEDESTAL CRANE DISTRIBUTION BOARD			X			X		10.00	10.00	1.00	0.85	0.80											
	EMERGENCY GENERATOR HYDRAULIC PUMP			X			X		3.20	4.00	0.80	0.85	0.80			11.76	8.82							
UPS-7814A	400V AC UPS LOADS - BYPASS (TELECOM)	X						X	7.80	14.00	0.56	0.85	0.95			3.76	2.82							
UPS-7814B	400V AC UPS LOADS - BYPASS (INST.)	X						X	43.80	57.00	0.77	0.95	0.95											
DU-7912	110V DC UPS LOADS (ALTERNATE)	X						X	12.00	14.00	0.86	0.95	0.95					8.21	2.70					
																		46.11	15.15					
	TURBINE GENERATOR AUX. LOADS GT-7560																	12.63	4.15					
	STARTER MOTOR		X					X	90.00	90.00	1.00	0.93	0.86											
	LUBRICATING OIL PUMP MOTOR		X					X	5.50	5.50	1.00	0.85	0.80					96.77	57.42					
	LIQUID FUEL PUMP MOTOR		X					X	11.00	11.00	1.00	0.85	0.85					6.47	4.85					
	TURBINE ENCLOSURE VENT FAN MOTOR		X					X	22.00	22.00	1.00	0.91	0.85					12.94	8.02					
	LUBRICATING OIL TANK HEATER		X					X	2.40	2.40	1.00	0.85	0.80					24.18	14.98					
	GENERATOR BOOST FAN MOTOR		X					X	11.00	11.00	1.00	0.85	0.85					2.62	2.12					
	AIR BLAST OIL COOLER FAN MOTOR		X					X	5.50	5.50	1.00	0.85	0.80					12.94	8.02					
	BATTERY CHARGER		X					X	5.50	5.50	1.00	0.85	0.80					6.47	4.85					
	WATER WASH		X					X	10.00	10.00	1.00	0.85	0.80					6.47	4.85					
																		11.76	8.82					
	LIGHTING & SMALL POWER LOADS																							
DB-7811A	NORMAL OUTDOOR LIGHTING DIST. BOARD			X		X			12.00	12.00	1.00	0.85	0.85	14.12	8.75									
DB-7812A	SMALL POWER & SOCKET OUTLETS DIST. BOARD			X		X			15.00	15.00	1.00	0.91	0.85	16.46	10.22									
DB-7812A	EMERGENCY OUTDOOR LIGHTING DIST. BOARD		X			X			10.00	10.00	1.00	0.85	0.80	11.76	8.82									
DB-7811B	NORMAL INDOOR LIGHTING DIST. BOARD			X		X			4.00	4.00	1.00	0.85	0.80	4.71	3.53									
DB-7821A	NORMAL LIGHTING DIST. BOARD			X		X			6.00	6.00	1.00	0.85	0.80	7.06	5.29									
DB-7841A	NORMAL LIGHTING DIST. BOARD			X		X			7.00	7.00	1.00	0.85	0.80	8.24	6.18									
DB-7851A	NORMAL LIGHTING DIST. BOARD			X		X			8.00	8.00	1.00	0.85	0.80	9.41	7.06									
DB-7852A	EMER. LIGHTING DIST. BOARD	X				X			7.00	7.00	1.00	0.85	0.80	8.24	6.18									
DB-7853A	SOCKET OUTLET DIST. BOARD			X		X			11.00	11.00	1.00	0.85	0.85	12.94	8.02									
DB-7811C	NORMAL INDOOR LIGHTING DIST. BOARD			X		X			14.00	14.00	1.00	0.85	0.85	16.47	10.21									
DB-7815A	SPACE HEATER DISTR. BOARD			X		X			5.00	5.00	1.00	1.00	1.00	5.00	0.00									
DB-7816A	MOV DISTR. BOARD			X		X			5.00	5.00	1.00	0.85	0.80	5.88	4.41									

Peak Loads

SUPG-B FULL LOAD CASE (LOAD SUMMARY)

	EQUIPMENT	CONSUMED LOAD											
		CONTINUOS		INTERMITTENT		STAND-BY		MAXIMUM			PEAK		
	DESCRIPTION	kW	kVAr	kW	kVAr	kW	kVAr	kW	kVAr	kVA	kW	kVAr	kVA
1	HV LOADS	1,578.90	728.90	0.00	0.00	789.45	364.45	1,578.90	728.90	1,739.03	2,168.36	980.01	2,379.53
2	LV LOADS	2,687.98	1,169.72	1,201.26	730.71	1,517.65	728.46	3,048.36	1,388.94	3,349.87	3,333.36	1,461.78	3,639.79
	TOTAL LOADS	4,266.88	1,898.62	1,201.26	730.71	2,307.10	1,092.91	4,627.26	2,117.84	5,088.90	5,501.71	2,441.79	6,019.32
	TOTAL LOADS (15% SPARE CAPACITY)	4,906.92	2,183.42	1,381.45	840.32	2,653.16	1,256.85	5,321.35	2,435.51	5,852.24	6,326.97	2,808.06	6,922.22

SUPG-B LOAD SHEDDING CASE (LOAD SUMMARY)

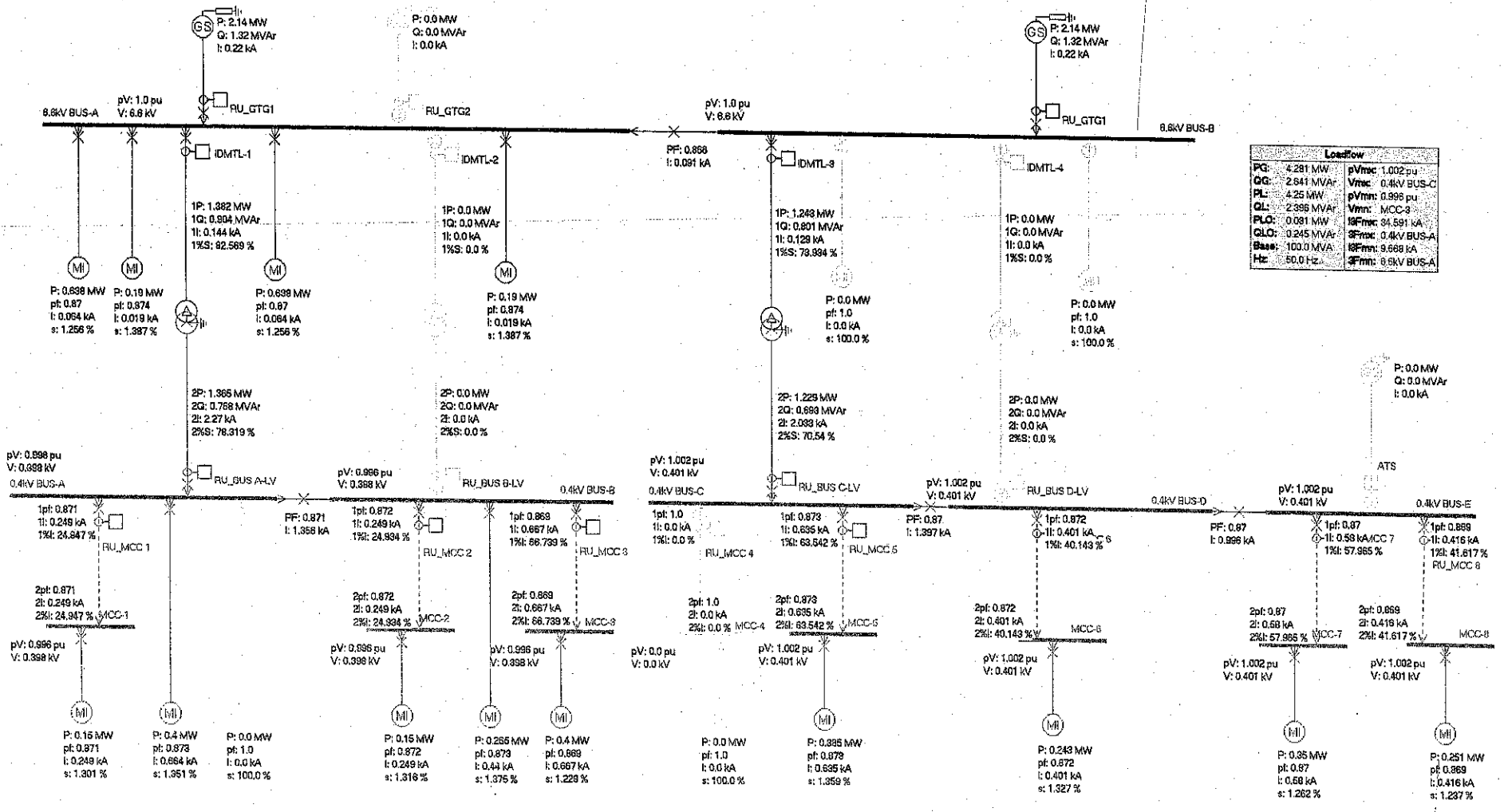
	EQUIPMENT	CONSUMED LOAD											
	DESCRIPTION	CONTINUOS		INTERMITTENT		STAND-BY		MAXIMUM			PEAK		
		kW	kVAr	kW	kVAr	kW	kVAr	kW	kVAr	kVA	kW	kVAr	kVA
1	HV LOADS	789.45	364.45	0.00	0.00	0.00	0.00	789.45	364.45	869.52	789.45	364.45	869.52
2	LV LOADS	2,391.35	986.11	1,066.26	649.88	0.00	0.00	2,711.23	1,181.07	2,957.31	2,711.23	1,181.07	2,957.31
TOTAL LOADS		3,180.80	1,350.56	1,066.26	649.88	0.00	0.00	3,500.68	1,545.52	3,826.83	3,500.68	1,545.52	3,826.83
TOTAL LOADS (15% SPARE CAPACITY)		3,657.92	1,553.14	1,226.20	747.36	0.00	0.00	4,025.78	1,777.35	4,400.85	4,025.78	1,777.35	4,400.85

SUPG-B EMERGENCY DIESEL GENERATOR CASE (LOAD SUMMARY)

	EQUIPMENT	CONSUMED LOAD											
	DESCRIPTION	CONTINUOS		INTERMITTENT		STAND-BY		MAXIMUM			PEAK		
		kW	kVAr	kW	kVAr	kW	kVAr	kW	kVAr	kVA	kW	kVAr	kVA
1	LV LOADS	707.83	415.96	305.31	189.74	417.77	223.61	799.43	412.88	928.82	853.19	504.78	991.33
TOTAL LOADS		707.83	415.96	305.31	189.74	417.77	223.61	799.43	412.88	928.82	853.19	504.78	991.33
TOTAL LOADS (15% SPARE CAPACITY)		814.00	478.35	351.11	218.20	480.44	257.15	919.34	474.81	1,068.14	981.17	580.50	1,140.03

APPENDIX C

ERACS LOAD FLOW PRINTOUTS – SCENARIO 1


6.6kV BUS-A
pV: 1.0 pu
V: 6.6 kV
P: 2.14 MW
Q: 1.32 MVAr
I: 0.22 kA
RU_GTG1
P: 0.0 MW
Q: 0.0 MVAr
I: 0.0 kA
RU_GTG2
pV: 1.0 pu
V: 6.6 kV
PF: 0.868
I: 0.091 kA
P: 2.14 MW
Q: 1.32 MVAr
I: 0.22 kA
RU_GTG1
6.6kV BUS-B
IDMTL-1
IDMTL-2
IDMTL-3
IDMTL-4
1P: 1.382 MW
1Q: 0.904 MVAr
1I: 0.144 kA
1%S: 82.569 %
1P: 0.0 MW
1Q: 0.0 MVAr
1I: 0.0 kA
1%S: 0.0 %
1P: 1.243 MW
1Q: 0.801 MVAr
1I: 0.129 kA
1%S: 79.994 %
1P: 0.0 MW
1Q: 0.0 MVAr
1I: 0.0 kA
1%S: 0.0 %
P: 0.638 MW
pf: 0.87
I: 0.064 kA
s: 1.256 %
P: 0.19 MW
pf: 0.874
I: 0.019 kA
s: 1.387 %
P: 0.638 MW
pf: 0.87
I: 0.064 kA
s: 1.256 %
P: 0.19 MW
pf: 0.874
I: 0.019 kA
s: 1.387 %
P: 0.0 MW
pf: 1.0
I: 0.0 kA
s: 100.0 %
P: 0.0 MW
pf: 1.0
I: 0.0 kA
s: 100.0 %
LoadFlow
PG: 4.281 MW
QG: 2.641 MVAr
PL: 4.25 MW
QL: 2.395 MVAr
PLO: 0.031 MW
QLO: 0.245 MVAr
Base: 100.0 MVA
Hz: 60.0 Hz
pVmx: 1.002 pu
Vmx: 0.4kV BUS-C
pVmn: 0.996 pu
Vmn: MCC-3
3Fmx: 34.591 kA
3Fmx: 0.4kV BUS-A
3Fmn: 9.668 kA
3Fmn: 6.6kV BUS-A
2P: 1.365 MW
2Q: 0.768 MVAr
2I: 2.27 kA
2%S: 78.319 %
2P: 0.0 MW
2Q: 0.0 MVAr
2I: 0.0 kA
2%S: 0.0 %
2P: 1.225 MW
2Q: 0.693 MVAr
2I: 2.033 kA
2%S: 70.54 %
2P: 0.0 MW
2Q: 0.0 MVAr
2I: 0.0 kA
2%S: 0.0 %
P: 0.0 MW
Q: 0.0 MVAr
I: 0.0 kA
ATS
pV: 0.998 pu
V: 0.998 kV
0.4kV BUS-A
RU_BUS A-LV
pV: 0.996 pu
V: 0.398 kV
RU_BUS B-LV
0.4kV BUS-B
pV: 1.002 pu
V: 0.401 kV
0.4kV BUS-C
RU_BUS C-LV
pV: 1.002 pu
V: 0.401 kV
RU_BUS D-LV
0.4kV BUS-D
pV: 1.002 pu
V: 0.401 kV
0.4kV BUS-E
1pf: 0.871
1I: 0.249 kA
1%I: 24.947 %
RU_MCC 1
PF: 0.871
I: 1.358 kA
1pf: 0.872
1I: 0.249 kA
1%I: 24.934 %
RU_MCC 2
1pf: 0.869
1I: 0.667 kA
1%I: 66.739 %
RU_MCC 3
1pf: 1.0
1I: 0.0 kA
1%I: 0.0 %
RU_MCC 4
1pf: 0.873
1I: 0.635 kA
1%I: 63.542 %
RU_MCC 5
PF: 0.87
I: 1.397 kA
1pf: 0.872
1I: 0.401 kA
1%I: 40.143 %
RU_MCC 6
PF: 0.87
I: 0.996 kA
1pf: 0.87
1I: 0.58 kA
1%I: 57.985 %
MCC 7
1pf: 0.869
1I: 0.416 kA
1%I: 41.617 %
RU_MCC 8
2pf: 0.871
2I: 0.249 kA
2%I: 24.947 %
MCC-1
2pf: 0.872
2I: 0.249 kA
2%I: 24.934 %
MCC-2
2pf: 0.869
2I: 0.667 kA
2%I: 66.739 %
MCC-3
2pf: 1.0
2I: 0.0 kA
2%I: 0.0 %
MCC-4
2pf: 0.873
2I: 0.635 kA
2%I: 63.542 %
MCC-5
2pf: 0.872
2I: 0.401 kA
2%I: 40.143 %
MCC-6
2pf: 0.87
2I: 0.58 kA
2%I: 57.985 %
MCC-7
2pf: 0.869
2I: 0.416 kA
2%I: 41.617 %
MCC-8
pV: 0.996 pu
V: 0.398 kV
pV: 0.996 pu
V: 0.398 kV
pV: 0.996 pu
V: 0.398 kV
pV: 0.0 pu
V: 0.0 kV
pV: 1.002 pu
V: 0.401 kV
pV: 1.002 pu
V: 0.401 kV
pV: 1.002 pu
V: 0.401 kV
pV: 1.002 pu
V: 0.401 kV
P: 0.16 MW
pf: 0.871
I: 0.249 kA
s: 1.301 %
P: 0.4 MW
pf: 0.873
I: 0.664 kA
s: 1.951 %
P: 0.0 MW
pf: 1.0
I: 0.0 kA
s: 100.0 %
P: 0.15 MW
pf: 0.872
I: 0.249 kA
s: 1.316 %
P: 0.255 MW
pf: 0.873
I: 0.44 kA
s: 1.375 %
P: 0.4 MW
pf: 0.869
I: 0.667 kA
s: 1.229 %
P: 0.0 MW
pf: 1.0
I: 0.0 kA
s: 100.0 %
P: 0.385 MW
pf: 0.873
I: 0.635 kA
s: 1.359 %
P: 0.243 MW
pf: 0.872
I: 0.401 kA
s: 1.327 %
P: 0.35 MW
pf: 0.87
I: 0.58 kA
s: 1.262 %
P: 0.251 MW
pf: 0.869
I: 0.416 kA
s: 1.237 %

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

SYSTEM STATISTICS

Study Base MVA	=	100.000
Study Base Frequency (Hz)	=	50.000
Number of Busbars	=	15
Number of Shunts	=	0
Number of Lines	=	0
Number of Cables	=	8
Number of Transformers	=	4
Number of Tap Changers	=	0
Number of Synchronous Machines	=	4
Number of Induction Machines	=	17
Number of Wind Turbine Generators	=	0
Number of Bus Sections	=	4
Number of Series Elements	=	0

STUDY PARAMETERS

Load Power Multiplier	=	1.000000
Load Reactive Multiplier	=	1.000000
Convergence Tolerance	=	0.000050
Convergence Control	=	Method 2
Maximum Iterations	=	25
Overload Flag Level	=	100.0% Of Rating
Automatic Tap Changers		OFF

BUSBAR DATA

Busbar Identifier	Nominal kV	Three Phase Fault MVA	Three Phase Fault kA	Single Phase Fault MVA	Single Phase Fault kA	Transf. Shift Angle (deg.)	Nominal Bus Freq. (Hz)	
6.6kV BUS-A	6.600	500.0	43.739	700.0	61.234	0.0	50.0	
6.6kV BUS-B	6.600	500.0	43.739	700.0	61.234	0.0	50.0	
0.4kV BUS-A	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-B	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-C	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-D	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-E	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-1	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-2	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-3	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-4	0.400	31.0	44.745	45.0	64.952	0.0	50.0	NOT IN USE
MCC-5	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-6	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-7	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-8	0.400	31.0	44.745	45.0	64.952	30.0	50.0	

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

CABLE DATA

First Busbar	Second Busbar	Cable Identifier	No.Of Ccts	Cable Length	Library Key	Rating (kA)	Positive Sequence R(pu)	X(pu)	B(pu)	Zero Sequence R(pu)	X(pu)	B(pu)	Equivalent Pi Model
0.4kV BUS-A	MCC-1	CABLE-1	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-B	MCC-2	CABLE-2	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-B	MCC-3	CABLE-3	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-C	MCC-4	CABLE-4	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-C	MCC-5	CABLE-5	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	CABLE OPEN AT FIRST BUS
0.4kV BUS-D	MCC-6	CABLE-6	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-E	MCC-7	CABLE-7	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-E	MCC-8	CABLE-8	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	

TRANSFORMER DATA

System Busbar	Winding No.	Rating (MVA)	Winding Type	Angle (deg.)	Pos/Neg. Sequence R(pu)	X(pu)	Zero Sequence R(pu)	X(pu)	Neutral Earth R(pu)	X(pu)	Voltage Ratio	Off-Nom Tap (%)	
DATA for Transformer with ID. TF-2				No. of units	1 using library key TRANSFORMER								
6.6kV BUS-A	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00	OPEN AT SYSTEM BUS
0.4kV BUS-B	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00	OPEN AT SYSTEM BUS
DATA for Transformer with ID. TF-1				No. of units	1 using library key TRANSFORMER								
6.6kV BUS-A	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00	
0.4kV BUS-A	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00	
DATA for Transformer with ID. TF-3				No. of units	1 using library key TRANSFORMER								
6.6kV BUS-B	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00	
0.4kV BUS-C	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00	
DATA for Transformer with ID. TF-4				No. of units	1 using library key TRANSFORMER								
6.6kV BUS-B	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00	OPEN AT SYSTEM BUS
0.4kV BUS-D	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00	OPEN AT SYSTEM BUS

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

INDUCTION MACHINE DATA

Busbar Identifier	Motor Identifier	No.Of Units	Library Key	Motor Ratings MVA	MW	kV	Input MW	Slip (%)	Stator R(pu)	Stator X(pu)	Magnet. X(pu)	Standstill R(pu)	Standstill X(pu)	Rotor Running R(pu)	Rotor Running X(pu)	
0.4kV BUS-A	GLY RBOILER	1	GLY REBOILER	0.500	0.440	0.400	0.400	1.2000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
0.4kV BUS-B	SUPERHEATER1	1	SUPERHEATER	0.326	0.285	0.400	0.265	1.2193	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
0.4kV BUS-A	SUPERHEATER2	1	SUPERHEATER	0.326	0.285	0.400	0.269	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
6.6kV BUS-A	SW-I PMP A	1	SW-I PMP	0.845	0.735	6.600	0.638	1.1325	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-A	SW-I PMP B	1	SW-I PMP	0.845	0.735	6.600	0.638	1.1325	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-B	SW-I PMP C	1	SW-I PMP	0.845	0.735	6.600	0.638	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
6.6kV BUS-A	SW-L PMP A	1	SW-L PMP	0.230	0.200	6.600	0.190	1.2391	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-A	SW-L PMP B	1	SW-L PMP	0.230	0.200	6.600	0.190	1.2391	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-B	SW-L PMP C	1	SW-L PMP	0.230	0.200	6.600	0.190	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
MCC-1	COMP TRAIN-A	1	COMP TRAIN A	0.194	0.165	0.400	0.150	1.1598	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-2	COMP TRAIN-B	1	COMP TRAIN B	0.192	0.164	0.400	0.150	1.1719	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-3	NORM PRCS LD	1	NORM PRCS LD	0.545	0.471	0.400	0.400	1.1009	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-4	COMP TRAIN-C	1	COMP TRAIN C	0.189	0.164	0.400	0.155	1.2302	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-5	NORM PRCS LD	1	NORM PCS LD2	0.473	0.407	0.400	0.385	1.2209	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
MCC-6	MINI LQ & LD	1	MINI LQ & LD	0.305	0.263	0.400	0.243	1.1951	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-7	PLT VITAL LD	1	PLT VITAL LD	0.460	0.400	0.400	0.350	1.1413	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-8	VTL MN LQ	1	VTL MN LQ	0.336	0.283	0.400	0.251	1.1205	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	

SYNCHRONOUS MACHINE DATA

Busbar Identifier	Machine Identifier	Type	No.Of Units	Library Key	Generator Ratings MVA BASE	MW	kV	Assigned V(pu)	Assigned MW	Assigned MVAR	Pos. Sequence R(pu)	Pos. Sequence X(pu)	Neg. Sequence R(pu)	Neg. Sequence X(pu)	Zero Sequence R(pu)	Zero Sequence X(pu)	
6.6kV BUS-A	GTG-1 NC	SLACK	1	GEN SET	4.370	3.500	6.600	1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500	
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000	
6.6kV BUS-A	GTG-2 NO	SLACK	1	GEN SET	4.370	NOT IN SERVICE		1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500	
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000	
6.6kV BUS-B	GTG-3 NC	SLACK	1	GEN SET	4.370	3.500	6.600	1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500	
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000	
0.4kV BUS-E	EDG	SLACK	1	DIESEL GEN	1.250	NOT IN SERVICE		0.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500	
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

BUS SECTION DATA

First Busbar	Second Busbar	Status
0.4kV BUS-C	0.4kV BUS-D	Closed
0.4kV BUS-A	0.4kV BUS-B	Closed
0.4kV BUS-D	0.4kV BUS-E	Closed
6.6kV BUS-A	6.6kV BUS-B	Closed

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

AT STUDY END - No of iterations = 4 Convergence = 0.5007E-05
Voltage Range from 0.996pu at MCC-3 to 1.002pu at 0.4kV BUS-C

AC BUSBAR VALUES

Busbar Identifier	Merge	Busbar Type	Voltage PU	Voltage kV	Voltage ANG-DEG	Synch. Machines MW	Synch. Machines MVAr	Ind Motor Load MW	Ind Motor Load MVAr	Shunt MW	Loads MVAr	3 Phase Fault kA	3 Phase Fault X/R	Ph - E Fault kA	Ph - E Fault X/R
6.6kV BUS-A	M1	SLACK	1.000	6.600	0.000	2.140	1.320	1.656	0.936	0.000	0.000	9.67	10.848	0.78	0.129
6.6kV BUS-B	M1	SLACK	1.000	6.600	0.000	2.140	1.320	0.000	0.000	0.000	0.000	9.67	10.848	0.78	0.129
0.4kV BUS-A	M2	LOAD	0.996	0.398	-3.816	0.000	0.000	0.400	0.224	0.000	0.000	34.59	10.608	30.31	9.243
0.4kV BUS-B	M2	LOAD	0.996	0.398	-3.816	0.000	0.000	0.265	0.148	0.000	0.000	34.59	10.608	30.31	9.243
0.4kV BUS-C	M3	LOAD	1.002	0.401	-3.415	0.000	0.000	0.000	0.000	0.000	0.000	33.47	10.408	29.74	9.161
0.4kV BUS-D	M3	LOAD	1.002	0.401	-3.415	0.000	0.000	0.000	0.000	0.000	0.000	33.47	10.408	29.74	9.161
0.4kV BUS-E	M3	LOAD	1.002	0.401	-3.415	0.000	0.000	0.000	0.000	0.000	0.000	33.47	10.408	29.74	9.161
MCC-1	.	LOAD	0.996	0.398	-3.817	0.000	0.000	0.150	0.084	0.000	0.000	34.51	10.388	30.24	9.094
MCC-2	.	LOAD	0.996	0.398	-3.817	0.000	0.000	0.150	0.084	0.000	0.000	34.51	10.387	30.24	9.094
MCC-3	.	LOAD	0.996	0.398	-3.817	0.000	0.000	0.400	0.228	0.000	0.000	34.52	10.424	30.25	9.111
MCC-5	.	LOAD	1.002	0.401	-3.416	0.000	0.000	0.385	0.215	0.000	0.000	33.40	10.233	29.68	9.032
MCC-6	.	LOAD	1.002	0.401	-3.416	0.000	0.000	0.243	0.136	0.000	0.000	33.40	10.216	29.68	9.024
MCC-7	.	LOAD	1.002	0.401	-3.416	0.000	0.000	0.350	0.198	0.000	0.000	33.40	10.232	29.68	9.031
MCC-8	.	LOAD	1.002	0.401	-3.416	0.000	0.000	0.251	0.143	0.000	0.000	33.40	10.220	29.68	9.025
MCC-4			BUS DISCONNECTED												
		BUSBAR TOTALS				4.281	2.641	4.250	2.396	0.000	0.000				
		TOTAL BUS LOAD				4.250	2.396								
		SYSTEM LOSSES				0.031	0.245								

CABLE VALUES

First Busbar	Second Busbar	Branch Identifier	No.Of Ccts	Rating kA	First End Flow MW	First End Flow MVAr	First End Flow kA	Second End Flow MW	Second End Flow MVAr	Second End Flow kA	Loading (%)	O/L FLAG
0.4kV BUS-A	MCC-1	CABLE-1	1	1.000	0.150	0.084	0.249	-0.150	-0.084	0.249	24.9	
0.4kV BUS-B	MCC-2	CABLE-2	1	1.000	0.150	0.084	0.249	-0.150	-0.084	0.249	24.9	
0.4kV BUS-B	MCC-3	CABLE-3	1	1.000	0.400	0.228	0.667	-0.400	-0.228	0.667	66.7	
0.4kV BUS-C	MCC-4	CABLE-4	1	BRANCH DISCONNECTED								
0.4kV BUS-C	MCC-5	CABLE-5	1	1.000	0.385	0.215	0.635	-0.385	-0.215	0.635	63.5	
0.4kV BUS-D	MCC-6	CABLE-6	1	1.000	0.243	0.136	0.401	-0.243	-0.136	0.401	40.1	
0.4kV BUS-E	MCC-7	CABLE-7	1	1.000	0.350	0.198	0.580	-0.350	-0.198	0.580	58.0	

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

CABLE VALUES

First Busbar	Second Busbar	Branch Identifier	No.Of Ccts	Rating kA	First End Flow MW	MVAr	kA	Second End Flow MW	MVAr	kA	Loading (%)	O/L FLAG
0.4kV BUS-E	MCC-8	CABLE-8	1	1.000	0.251	0.143	0.416	-0.251	-0.143	0.416	41.6	

TRANSFORMER VALUES

Transformer Identifier	No.Of Units	Winding No.	Connected Busbar	Winding kV	Voltage Ratio	Off Nominal Tap %	Rating MVA	Flow From Busbar MW	MVAr	Current kA	Percent Loading	O/L Flag
TF-2	1	1	6.6kV BUS-A	- WINDING DISCONNECTED								
		2	0.4kV BUS-B	- WINDING DISCONNECTED								
TF-1	1	1	6.6kV BUS-A	6.600	1.0000	0.000	2.000	1.382	0.904	0.144	82.6	
		2	0.4kV BUS-A	0.420	1.0500	0.000	2.000	-1.365	-0.768	2.270	78.3	
TF-3	1	1	6.6kV BUS-B	6.600	1.0000	0.000	2.000	1.243	0.801	0.129	73.9	
		2	0.4kV BUS-C	0.420	1.0500	0.000	2.000	-1.229	-0.693	2.033	70.5	
TF-4	1	1	6.6kV BUS-B	- WINDING DISCONNECTED								
		2	0.4kV BUS-D	- WINDING DISCONNECTED								

BRANCH LOSS SUMMARY

	(MW)	(MVAr)
SERIES LOSSES	0.031	0.245
SHUNT LOSSES	0.000	0.000
TOTAL LOSSES	0.031	0.245

INDUCTION MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Slip %	Terminal Voltage kV	Machine Input MW	MVAr	Current kA	O/L Flag
0.4kV BUS-A	GLY RBOILER	1	1.35	0.398	0.400	0.224	0.664	
0.4kV BUS-B	SUPERHEATER1	1	1.37	0.398	0.265	0.148	0.440	
0.4kV BUS-A	SUPERHEATER2	1	MACHINE DISCONNECTED					
6.6kV BUS-A	SW-I PMP A	1	1.26	6.600	0.638	0.362	0.064	

Network Name : SUPG-B_070507
Data State Name : SUPG-B_NORM OPERATION

INDUCTION MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Slip %	Terminal Voltage kV	Machine Input MW	MVAr	Current kA	O/L Flag
6.6kV BUS-A	SW-I PMP B	1	1.26	6.600	0.638	0.362	0.064	
6.6kV BUS-B	SW-I PMP C	1	MACHINE DISCONNECTED					
6.6kV BUS-A	SW-L PMP A	1	1.39	6.600	0.190	0.106	0.019	
6.6kV BUS-A	SW-L PMP B	1	1.39	6.600	0.190	0.106	0.019	
6.6kV BUS-B	SW-L PMP C	1	MACHINE DISCONNECTED					
MCC-1	COMP TRAIN-A	1	1.30	0.398	0.150	0.084	0.249	
MCC-2	COMP TRAIN-B	1	1.32	0.398	0.150	0.084	0.249	
MCC-3	NORM PRCS LD	1	1.23	0.398	0.400	0.228	0.667	
MCC-4	COMP TRAIN-C	1	MACHINE DISCONNECTED					
MCC-5	NORM PRCS LD	1	1.36	0.401	0.385	0.215	0.635	
MCC-6	MINI LQ & LD	1	1.33	0.401	0.243	0.136	0.401	
MCC-7	PLT VITAL LD	1	1.26	0.401	0.350	0.198	0.580	
MCC-8	VTL MN LQ	1	1.24	0.401	0.251	0.143	0.416	

SYNCHRONOUS MACHINE VALUES

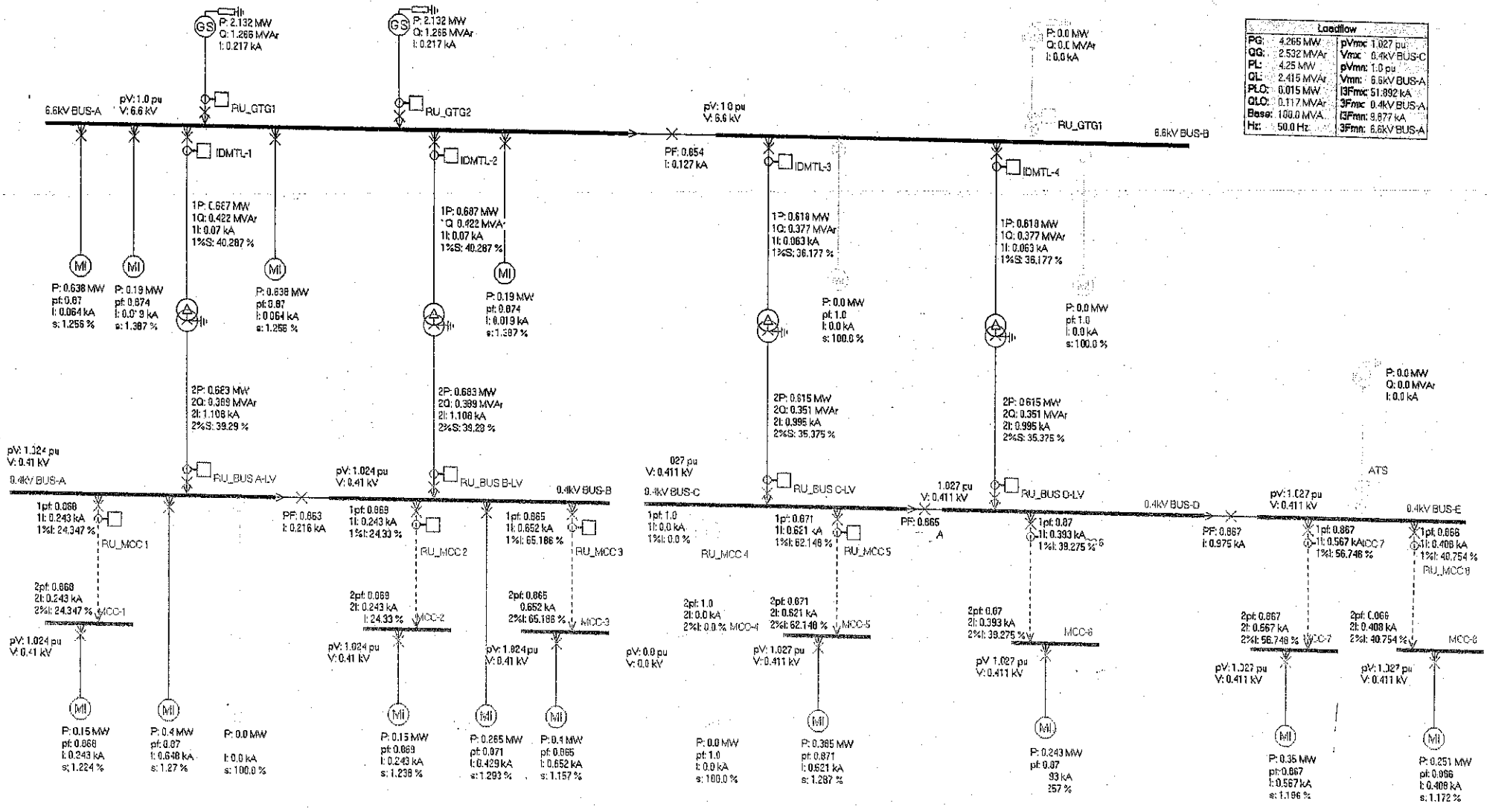
Busbar Identifier	Machine Identifier	No.Of Units	Terminal Voltage kV	Power MW	Output MVAr	Current kA	O/L Flag
6.6kV BUS-A	GTG-1 NC	1	6.600	2.140	1.320	0.220	
6.6kV BUS-A	GTG-2 NO	1	MACHINE DISCONNECTED				
6.6kV BUS-B	GTG-3 NC	1	6.600	2.140	1.320	0.220	
0.4kV BUS-E	EDG	1	MACHINE DISCONNECTED				

BUS SECTION VALUES

First Busbar	Second Busbar	MW	MVAr	kA
0.4kV BUS-C	0.4kV BUS-D	0.844	0.478	1.397
0.4kV BUS-A	0.4kV BUS-B	0.815	0.460	1.356
0.4kV BUS-D	0.4kV BUS-E	0.601	0.341	0.996
6.6kV BUS-A	6.6kV BUS-B	-0.898	-0.519	0.091

APPENDIX D

ERACS LOAD FLOW PRINTOUTS – SCENARIO 2


Loadflow
PG: 4.265 MW
QG: 2.532 MVAr
PL: 4.25 MW
QL: 2.415 MVAr
PLO: 0.015 MW
QLO: 0.117 MVAr
Base: 100.0 MVA
Hz: 50.0 Hz
pVmx: 1.027 pu
Vmx: 0.4kV BUS-C
pVmn: 1.0 pu
Vmn: 6.6kV BUS-A
I3Fmx: 51.892 kA
3Fmx: 0.4kV BUS-A
I3Fmn: 9.677 kA
3Fmn: 6.6kV BUS-A
6.6kV BUS-A
pV: 1.0 pu
V: 6.6 kV
RU_GTG1
P: 2.132 MW
Q: 1.266 MVAr
I: 0.217 kA
RU_GTG2
P: 2.132 MW
Q: 1.266 MVAr
I: 0.217 kA
IDMTL-1
IDMTL-2
1P: 0.687 MW
1Q: 0.422 MVAr
1I: 0.07 kA
1%S: 40.287 %
P: 0.638 MW
pf: 0.87
I: 0.064 kA
s: 1.256 %
P: 0.19 MW
pf: 0.874
I: 0.019 kA
s: 1.387 %
2P: 0.683 MW
2Q: 0.389 MVAr
2I: 1.106 kA
2%S: 39.29 %
RU_BUS A-LV
RU_BUS B-LV
0.4kV BUS-A
0.4kV BUS-B
PF: 0.863
I: 0.216 kA
1pf: 0.866
1I: 0.243 kA
1%I: 24.347 %
RU_MCC 1
2pf: 0.868
2I: 0.243 kA
2%I: 24.347 %
MCC-1
P: 0.15 MW
pf: 0.868
I: 0.243 kA
s: 1.224 %
P: 0.4 MW
pf: 0.87
I: 0.648 kA
s: 1.27 %
P: 0.0 MW
I: 0.0 kA
s: 100.0 %
1pf: 0.869
1I: 0.243 kA
1%I: 24.33 %
RU_MCC 2
2pf: 0.869
2I: 0.243 kA
I: 24.33 %
MCC-2
P: 0.15 MW
pf: 0.869
I: 0.243 kA
s: 1.238 %
1pf: 0.865
1I: 0.652 kA
1%I: 65.186 %
RU_MCC 3
2pf: 0.865
0.652 kA
2%I: 65.186 %
MCC-3
P: 0.265 MW
pf: 0.871
I: 0.429 kA
s: 1.293 %
P: 0.4 MW
pf: 0.865
I: 0.652 kA
s: 1.157 %
pV: 1.024 pu
V: 0.41 kV
pV: 1.0 pu
V: 6.6 kV
PF: 0.654
I: 0.127 kA
6.6kV BUS-B
IDMTL-3
IDMTL-4
1P: 0.618 MW
1Q: 0.377 MVAr
1I: 0.063 kA
1%S: 36.177 %
P: 0.0 MW
pf: 1.0
I: 0.0 kA
s: 100.0 %
2P: 0.615 MW
2Q: 0.351 MVAr
2I: 0.995 kA
2%S: 35.375 %
RU_BUS C-LV
RU_BUS D-LV
0.4kV BUS-C
0.4kV BUS-D
1.027 pu
V: 0.411 kV
1pf: 1.0
1I: 0.0 kA
1%I: 0.0 %
RU_MCC 4
2pf: 1.0
2I: 0.0 kA
2%I: 0.0 % MCC-4
P: 0.0 MW
pf: 1.0
I: 0.0 kA
s: 100.0 %
1pf: 0.871
1I: 0.621 kA
1%I: 62.148 %
RU_MCC 5
2pf: 0.871
2I: 0.621 kA
2%I: 62.148 %
MCC-5
P: 0.395 MW
pf: 0.871
I: 0.621 kA
s: 1.287 %
PF: 0.865
A
1pf: 0.87
1I: 0.393 kA
1%I: 39.275 %
RU_MCC 6
2pf: 0.87
2I: 0.393 kA
2%I: 39.275 %
MCC-6
P: 0.243 MW
pf: 0.87
93 kA
257 %
P: 0.0 MW
Q: 0.0 MVAr
I: 0.0 kA
ATS
PF: 0.867
I: 0.975 kA
1pf: 0.867
1I: 0.567 kA
1%I: 56.748 %
RU_MCC 7
2pf: 0.867
2I: 0.567 kA
2%I: 56.748 %
MCC-7
P: 0.35 MW
pf: 0.867
I: 0.567 kA
s: 1.196 %
1pf: 0.868
1I: 0.408 kA
1%I: 40.754 %
RU_MCC 8
2pf: 0.868
2I: 0.408 kA
2%I: 40.754 %
MCC-8
P: 0.251 MW
pf: 0.868
I: 0.408 kA
s: 1.172 %
pV: 1.027 pu
V: 0.411 kV
pV: 0.0 pu
V: 0.0 kV

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

SYSTEM STATISTICS

Study Base MVA	=	100.000
Study Base Frequency (Hz)	=	50.000
Number of Busbars	=	15
Number of Shunts	=	0
Number of Lines	=	0
Number of Cables	=	8
Number of Transformers	=	4
Number of Tap Changers	=	0
Number of Synchronous Machines	=	4
Number of Induction Machines	=	17
Number of Wind Turbine Generators	=	0
Number of Bus Sections	=	4
Number of Series Elements	=	0

STUDY PARAMETERS

Load Power Multiplier	= 1.000000
Load Reactive Multiplier	= 1.000000
Convergence Tolerance	= 0.000050
Convergence Control	= Method 2
Maximum Iterations	= 25
Overload Flag Level	= 100.0% Of Rating
Automatic Tap Changers	OFF

BUSBAR DATA

Busbar Identifier	Nominal kV	Three Phase Fault MVA	Three Phase Fault kA	Single Phase Fault MVA	Single Phase Fault kA	Transf. Shift Angle (deg.)	Nominal Bus Freq. (Hz)
6.6kV BUS-A	6.600	500.0	43.739	700.0	61.234	0.0	50.0
6.6kV BUS-B	6.600	500.0	43.739	700.0	61.234	0.0	50.0
0.4kV BUS-A	0.400	31.0	44.745	45.0	64.952	30.0	50.0
0.4kV BUS-B	0.400	31.0	44.745	45.0	64.952	30.0	50.0
0.4kV BUS-C	0.400	31.0	44.745	45.0	64.952	30.0	50.0
0.4kV BUS-D	0.400	31.0	44.745	45.0	64.952	30.0	50.0
0.4kV BUS-E	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-1	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-2	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-3	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-4	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-5	0.400	31.0	44.745	45.0	64.952	0.0	50.0NOT IN USE
MCC-6	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-7	0.400	31.0	44.745	45.0	64.952	30.0	50.0
MCC-8	0.400	31.0	44.745	45.0	64.952	30.0	50.0

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

CABLE DATA

First Busbar	Second Busbar	Cable Identifier	No.Of Ccts	Cable Length	Library Key	Rating (kA)	Positive Sequence R(pu)	Positive Sequence X(pu)	Positive Sequence B(pu)	Zero Sequence R(pu)	Zero Sequence X(pu)	Zero Sequence B(pu)	Equivalent Pi Model
0.4kV BUS-A	MCC-1	CABLE-1	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-B	MCC-2	CABLE-2	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-B	MCC-3	CABLE-3	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-C	MCC-4	CABLE-4	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-C	MCC-5	CABLE-5	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	CABLE OPEN AT FIRST BUS
0.4kV BUS-D	MCC-6	CABLE-6	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-E	MCC-7	CABLE-7	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-E	MCC-8	CABLE-8	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	

TRANSFORMER DATA

System Busbar	Winding No.	Rating (MVA)	Winding Type	Angle (deg.)	Pos/Neg. Sequence R(pu)	Pos/Neg. Sequence X(pu)	Zero Sequence R(pu)	Zero Sequence X(pu)	Neutral Earth R(pu)	Neutral Earth X(pu)	Voltage Ratio	Off-Nom Tap (%)
DATA for Transformer with ID. TF-2				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-A	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-B	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00
DATA for Transformer with ID. TF-1				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-A	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-A	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00
DATA for Transformer with ID. TF-3				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-B	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-C	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00
DATA for Transformer with ID. TF-4				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-B	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-D	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

INDUCTION MACHINE DATA

Busbar Identifier	Motor Identifier	No.Of Units	Library Key	Motor Ratings MVA	MW	kV	Input MW	Slip (%)	Stator R(pu)	Stator X(pu)	Magnet. X(pu)	Standstill R(pu)	Standstill X(pu)	Rotor Running R(pu)	Rotor Running X(pu)	
0.4kV BUS-A	GLY RBOILER	1	GLY REBOILER	0.500	0.440	0.400	0.400	1.2000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
0.4kV BUS-B	SUPERHEATER1	1	SUPERHEATER	0.326	0.285	0.400	0.265	1.2193	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
0.4kV BUS-A	SUPERHEATER2	1	SUPERHEATER	0.326	0.285	0.400	0.269	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-A	SW-I PMP A	1	SW-I PMP	0.845	0.735	6.600	0.638	1.1325	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
6.6kV BUS-A	SW-I PMP B	1	SW-I PMP	0.845	0.735	6.600	0.638	1.1325	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-B	SW-I PMP C	1	SW-I PMP	0.845	0.735	6.600	0.638	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-A	SW-L PMP A	1	SW-L PMP	0.230	0.200	6.600	0.190	1.2391	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
6.6kV BUS-A	SW-L PMP B	1	SW-L PMP	0.230	0.200	6.600	0.190	1.2391	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-B	SW-L PMP C	1	SW-L PMP	0.230	0.200	6.600	0.190	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-1	COMP TRAIN-A	1	COMP TRAIN A	0.194	0.165	0.400	0.150	1.1598	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
MCC-2	COMP TRAIN-B	1	COMP TRAIN B	0.192	0.164	0.400	0.150	1.1719	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-3	NORM PRCS LD	1	NORM PRCS LD	0.545	0.471	0.400	0.400	1.1009	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-4	COMP TRAIN-C	1	COMP TRAIN C	0.189	0.164	0.400	0.155	1.2302	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-5	NORM PRCS LD	1	NORM PCS LD2	0.473	0.407	0.400	0.385	1.2209	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVICE
MCC-6	MINI LQ & LD	1	MINI LQ & LD	0.305	0.263	0.400	0.243	1.1951	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-7	PLT VITAL LD	1	PLT VITAL LD	0.460	0.400	0.400	0.350	1.1413	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-8	VTL MN LQ	1	VTL MN LQ	0.336	0.283	0.400	0.251	1.1205	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	

SYNCHRONOUS MACHINE DATA

Busbar Identifier	Machine Identifier	Type	No.Of Units	Library Key	Generator Ratings MVA BASE	MW	kV	Assigned V(pu)	Assigned MW	Assigned MVAR	Pos. Sequence R(pu)	Pos. Sequence X(pu)	Neg. Sequence R(pu)	Neg. Sequence X(pu)	Zero Sequence R(pu)	Zero Sequence X(pu)
6.6kV BUS-A	GTG-1 NC	SLACK	1	GEN SET	4.370	3.500	6.600	1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000
6.6kV BUS-A	GTG-2 NO	SLACK	1	GEN SET	4.370	3.500	6.600	1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000
6.6kV BUS-B	GTG-3 NC	SLACK	1	GEN SET	4.370	NOT IN SERVICE		0.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000
0.4kV BUS-E	EDG	SLACK	1	DIESEL GEN	1.250	NOT IN SERVICE		0.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

BUS SECTION DATA

First Busbar	Second Busbar	Status
0.4kV BUS-C	0.4kV BUS-D	Closed
0.4kV BUS-A	0.4kV BUS-B	Closed
0.4kV BUS-D	0.4kV BUS-E	Closed
6.6kV BUS-A	6.6kV BUS-B	Closed

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

AT STUDY END - No of iterations = 4 Convergence = 0.6557E-05
Voltage Range from 1.000pu at 6.6kV BUS-A to 1.027pu at 0.4kV BUS-C

AC BUSBAR VALUES

Busbar Identifier	Merge	Busbar Type	Voltage PU	Voltage kV	Voltage ANG-DEG	Synch. Machines MW	Synch. Machines MVAr	Ind Motor Load MW	Ind Motor Load MVAr	Shunt Loads MW	Shunt Loads MVAr	3 Phase Fault kA	3 Phase Fault X/R	Ph - E Fault kA	Ph - E Fault X/R
6.6kV BUS-A	M1	SLACK	1.000	6.600	0.000	4.265	2.532	1.656	0.936	0.000	0.000	9.88	11.047	0.78	0.127
6.6kV BUS-B	M1	LOAD	1.000	6.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.88	11.047	0.78	0.127
0.4kV BUS-A	M2	LOAD	1.024	0.410	-1.853	0.000	0.000	0.400	0.226	0.000	0.000	51.89	10.056	49.34	8.929
0.4kV BUS-B	M2	LOAD	1.024	0.410	-1.853	0.000	0.000	0.265	0.149	0.000	0.000	51.89	10.056	49.34	8.929
0.4kV BUS-C	M3	LOAD	1.027	0.411	-1.664	0.000	0.000	0.000	0.000	0.000	0.000	50.72	9.919	48.55	8.850
0.4kV BUS-D	M3	LOAD	1.027	0.411	-1.664	0.000	0.000	0.000	0.000	0.000	0.000	50.72	9.919	48.55	8.850
0.4kV BUS-E	M3	LOAD	1.027	0.411	-1.664	0.000	0.000	0.000	0.000	0.000	0.000	50.72	9.919	48.55	8.850
MCC-1	.	LOAD	1.024	0.410	-1.853	0.000	0.000	0.150	0.086	0.000	0.000	51.70	9.764	49.16	8.708
MCC-2	.	LOAD	1.024	0.410	-1.853	0.000	0.000	0.150	0.085	0.000	0.000	51.70	9.764	49.16	8.708
MCC-3	.	LOAD	1.024	0.410	-1.854	0.000	0.000	0.400	0.232	0.000	0.000	51.72	9.796	49.17	8.726
MCC-5	.	LOAD	1.027	0.411	-1.665	0.000	0.000	0.385	0.217	0.000	0.000	50.56	9.667	48.39	8.651
MCC-6	.	LOAD	1.027	0.411	-1.664	0.000	0.000	0.243	0.138	0.000	0.000	50.55	9.652	48.39	8.643
MCC-7	.	LOAD	1.027	0.411	-1.665	0.000	0.000	0.350	0.201	0.000	0.000	50.56	9.666	48.39	8.651
MCC-8	.	LOAD	1.027	0.411	-1.664	0.000	0.000	0.251	0.145	0.000	0.000	50.55	9.655	48.39	8.644
MCC-4		BUS DISCONNECTED													
		BUSBAR TOTALS				4.265	2.532	4.250	2.415	0.000	0.000				
		TOTAL BUS LOAD				4.250	2.415								
		SYSTEM LOSSES				0.015	0.117								

CABLE VALUES

First Busbar	Second Busbar	Branch Identifier	No.Of Ccts	Rating kA	First End Flow MW	First End Flow MVAr	First End Flow kA	Second End Flow MW	Second End Flow MVAr	Second End Flow kA	Loading (%)	O/L FLAG
0.4kV BUS-A	MCC-1	CABLE-1	1	1.000	0.150	0.086	0.243	-0.150	-0.086	0.243	24.3	
0.4kV BUS-B	MCC-2	CABLE-2	1	1.000	0.150	0.085	0.243	-0.150	-0.085	0.243	24.3	
0.4kV BUS-B	MCC-3	CABLE-3	1	1.000	0.400	0.232	0.652	-0.400	-0.232	0.652	65.2	
0.4kV BUS-C	MCC-4	CABLE-4	1	BRANCH DISCONNECTED								
0.4kV BUS-C	MCC-5	CABLE-5	1	1.000	0.385	0.217	0.621	-0.385	-0.217	0.621	62.1	
0.4kV BUS-D	MCC-6	CABLE-6	1	1.000	0.243	0.138	0.393	-0.243	-0.138	0.393	39.3	
0.4kV BUS-E	MCC-7	CABLE-7	1	1.000	0.350	0.201	0.567	-0.350	-0.201	0.567	56.7	

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

CABLE VALUES

First Busbar	Second Busbar	Branch Identifier	No.Of Ccts	Rating kA	First MW	End MVAr	Flow kA	Second MW	End MVAr	Flow kA	Loading (%)	O/L FLAG
0.4kV BUS-E	MCC-8	CABLE-8	1	1.000	0.251	0.145	0.408	-0.251	-0.145	0.408	40.8	

TRANSFORMER VALUES

Transformer Identifier	No.Of Units	Winding No.	Connected Busbar	Winding kV	Voltage Ratio	Off Nominal Tap %	Rating MVA	Flow From Busbar MW	MVAr	Current kA	Percent O/L Loading Flag
TF-2	1	1	6.6kV BUS-A	6.600	1.0000	0.000	2.000	0.687	0.422	0.070	40.3
		2	0.4kV BUS-B	0.420	1.0500	0.000	2.000	-0.683	-0.389	1.108	39.3
TF-1	1	1	6.6kV BUS-A	6.600	1.0000	0.000	2.000	0.687	0.422	0.070	40.3
		2	0.4kV BUS-A	0.420	1.0500	0.000	2.000	-0.683	-0.389	1.108	39.3
TF-3	1	1	6.6kV BUS-B	6.600	1.0000	0.000	2.000	0.618	0.377	0.063	36.2
		2	0.4kV BUS-C	0.420	1.0500	0.000	2.000	-0.615	-0.351	0.995	35.4
TF-4	1	1	6.6kV BUS-B	6.600	1.0000	0.000	2.000	0.618	0.377	0.063	36.2
		2	0.4kV BUS-D	0.420	1.0500	0.000	2.000	-0.615	-0.351	0.995	35.4

BRANCH LOSS SUMMARY

	(MW)	(MVAr)
SERIES LOSSES	0.015	0.117
SHUNT LOSSES	0.000	0.000
TOTAL LOSSES	0.015	0.117

INDUCTION MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Slip %	Terminal Voltage kV	Machine Input MW	MVAr	Current kA	O/L Flag
0.4kV BUS-A	GLY RBOILER	1	1.27	0.410	0.400	0.226	0.648	
0.4kV BUS-B	SUPERHEATER1	1	1.29	0.410	0.265	0.149	0.429	
0.4kV BUS-A	SUPERHEATER2	1	MACHINE DISCONNECTED					
6.6kV BUS-A	SW-I PMP A	1	1.26	6.600	0.638	0.362	0.064	

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1

INDUCTION MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Slip %	Terminal Voltage kV	Machine Input MW	MVAr	Current kA	O/L Flag
6.6kV BUS-A	SW-I PMP B	1	1.26	6.600	0.638	0.362	0.064	
6.6kV BUS-B	SW-I PMP C	1	MACHINE DISCONNECTED					
6.6kV BUS-A	SW-L PMP A	1	1.39	6.600	0.190	0.106	0.019	
6.6kV BUS-A	SW-L PMP B	1	1.39	6.600	0.190	0.106	0.019	
6.6kV BUS-B	SW-L PMP C	1	MACHINE DISCONNECTED					
MCC-1	COMP TRAIN-A	1	1.22	0.410	0.150	0.086	0.243	
MCC-2	COMP TRAIN-B	1	1.24	0.410	0.150	0.085	0.243	
MCC-3	NORM PRCS LD	1	1.16	0.410	0.400	0.232	0.652	
MCC-4	COMP TRAIN-C	1	MACHINE DISCONNECTED					
MCC-5	NORM PRCS LD	1	1.29	0.411	0.385	0.217	0.621	
MCC-6	MINI LQ & LD	1	1.26	0.411	0.243	0.138	0.393	
MCC-7	PLT VITAL LD	1	1.20	0.411	0.350	0.201	0.567	
MCC-8	VTL MN LQ	1	1.17	0.411	0.251	0.145	0.408	

SYNCHRONOUS MACHINE VALUES

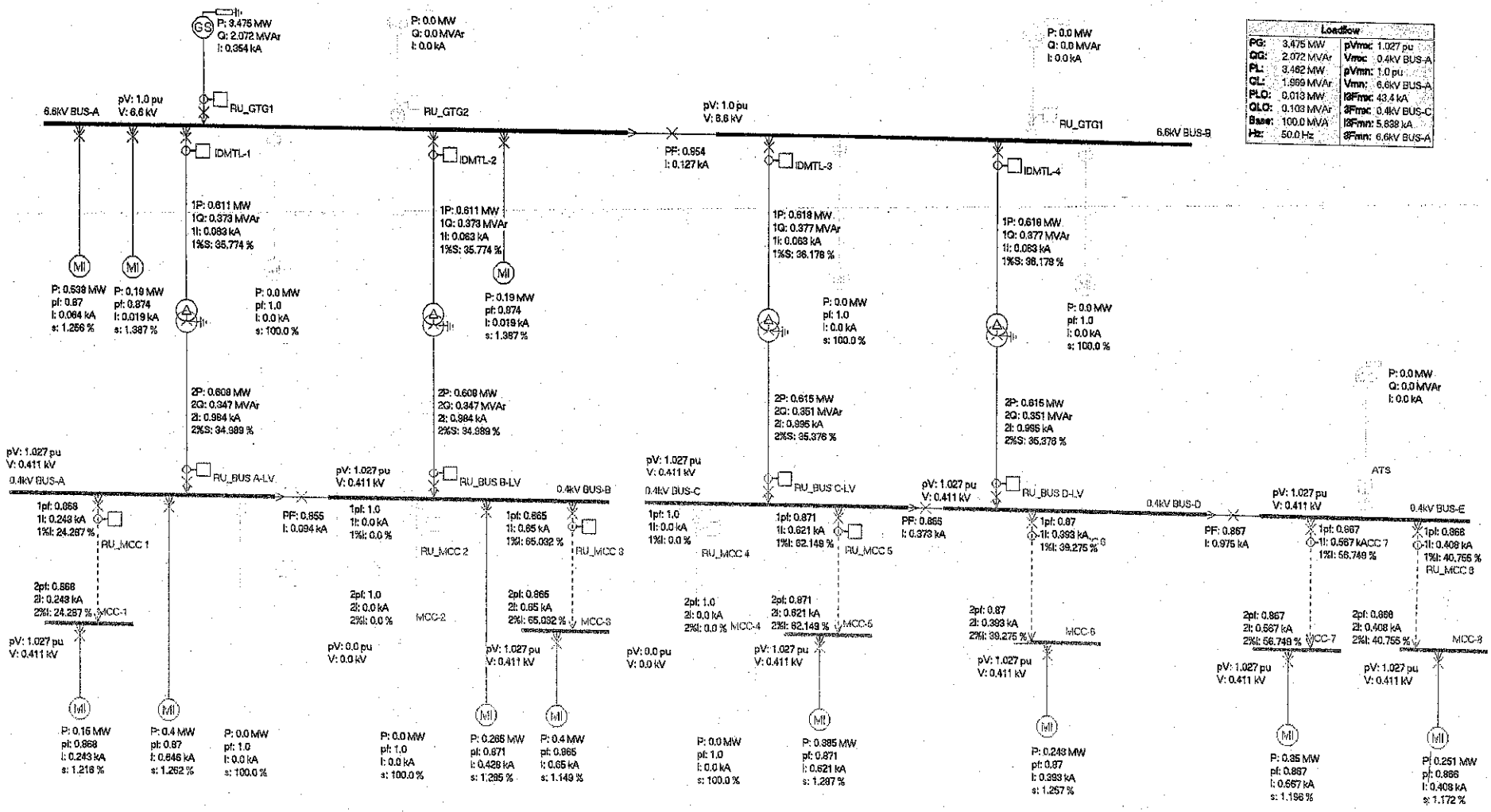
Busbar Identifier	Machine Identifier	No.Of Units	Terminal Voltage kV	Power MW	Output MVAr	Current kA	O/L Flag
6.6kV BUS-A	GTG-1 NC	1	6.600	2.132	1.266	0.217	
6.6kV BUS-A	GTG-2 NO	1	6.600	2.132	1.266	0.217	
6.6kV BUS-B	GTG-3 NC	1	MACHINE DISCONNECTED				
0.4kV BUS-E	EDG	1	MACHINE DISCONNECTED				

BUS SECTION VALUES

First Busbar	Second Busbar	MW	MVAr	kA
0.4kV BUS-C	0.4kV BUS-D	0.230	0.133	0.373
0.4kV BUS-A	0.4kV BUS-B	0.133	0.077	0.216
0.4kV BUS-D	0.4kV BUS-E	0.601	0.346	0.975
6.6kV BUS-A	6.6kV BUS-B	1.236	0.753	0.127

APPENDIX E

ERACS LOAD FLOW PRINTOUTS – SCENARIO 3


Loadflow
PG: 3.475 MW
QG: 2.072 MVAr
PL: 3.462 MW
QL: 1.999 MVAr
PLO: 0.013 MW
QLO: 0.103 MVAr
Base: 100.0 MVA
Hz: 50.0 Hz
pVmx: 1.027 pu
Vmx: 0.4kV BUS-A
pVmn: 1.0 pu
Vmn: 6.6kV BUS-A
I3Fmx: 43.4 kA
3Fmx: 0.4kV BUS-C
I3Fmn: 5.838 kA
3Fmn: 6.6kV BUS-A
6.6kV BUS-A
6.6kV BUS-B
RU_GTG1
RU_GTG2
IDMTL-1
IDMTL-2
IDMTL-3
IDMTL-4
RU_BUS A-LV
RU_BUS B-LV
RU_BUS C-LV
RU_BUS D-LV
0.4kV BUS-A
0.4kV BUS-B
0.4kV BUS-C
0.4kV BUS-D
0.4kV BUS-E
ATS
RU_MCC 1
RU_MCC 2
RU_MCC 3
RU_MCC 4
RU_MCC 5
RU_MCC 6
RU_MCC 7
RU_MCC 8
MCC-1
MCC-2
MCC-3
MCC-4
MCC-5
MCC-6
MCC-7
MCC-8

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

SYSTEM STATISTICS

Study Base MVA	=	100.000
Study Base Frequency (Hz)	=	50.000
Number of Busbars	=	15
Number of Shunts	=	0
Number of Lines	=	0
Number of Cables	=	8
Number of Transformers	=	4
Number of Tap Changers	=	0
Number of Synchronous Machines	=	4
Number of Induction Machines	=	17
Number of Wind Turbine Generators	=	0
Number of Bus Sections	=	4
Number of Series Elements	=	0

STUDY PARAMETERS

Load Power Multiplier	=	1.000000
Load Reactive Multiplier	=	1.000000
Convergence Tolerance	=	0.000050
Convergence Control	=	Method 2
Maximum Iterations	=	25
Overload Flag Level	=	100.0% Of Rating
Automatic Tap Changers		OFF

BUSBAR DATA

Busbar Identifier	Nominal kV	Three Phase Fault MVA	Three Phase Fault kA	Single Phase Fault MVA	Single Phase Fault kA	Transf. Shift Angle (deg.)	Nominal Bus Freq. (Hz)	
6.6kV BUS-A	6.600	500.0	43.739	700.0	61.234	0.0	50.0	
6.6kV BUS-B	6.600	500.0	43.739	700.0	61.234	0.0	50.0	
0.4kV BUS-A	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-B	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-C	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-D	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
0.4kV BUS-E	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-1	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-2	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-3	0.400	31.0	44.745	45.0	64.952	0.0	50.0	NOT IN USE
MCC-4	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-5	0.400	31.0	44.745	45.0	64.952	0.0	50.0	NOT IN USE
MCC-6	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-7	0.400	31.0	44.745	45.0	64.952	30.0	50.0	
MCC-8	0.400	31.0	44.745	45.0	64.952	30.0	50.0	

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

CABLE DATA

First Busbar	Second Busbar	Cable Identifier	No.Of Ccts	Cable Length	Library Key	Rating (kA)	Positive Sequence R(pu)	Positive Sequence X(pu)	Positive Sequence B(pu)	Zero Sequence R(pu)	Zero Sequence X(pu)	Zero Sequence B(pu)	Equivalent Pi Model
0.4kV BUS-A	MCC-1	CABLE-1	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-B	MCC-2	CABLE-2	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
BUS													
0.4kV BUS-B	MCC-3	CABLE-3	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	CABLE OPEN AT FIR
0.4kV BUS-C	MCC-4	CABLE-4	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
BUS													
0.4kV BUS-C	MCC-5	CABLE-5	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	CABLE OPEN AT FIR
0.4kV BUS-D	MCC-6	CABLE-6	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-E	MCC-7	CABLE-7	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	
0.4kV BUS-E	MCC-8	CABLE-8	1	1.00	CABLE_MCC	1.000	0.0100	0.0100	0.0000	0.0100	0.0100	0.0000	

TRANSFORMER DATA

System Busbar	Winding No.	Rating (MVA)	Winding Type	Angle (deg.)	Pos/Neg. Sequence R(pu)	Pos/Neg. Sequence X(pu)	Zero Sequence R(pu)	Zero Sequence X(pu)	Neutral Earth R(pu)	Neutral Earth X(pu)	Voltage Ratio	Off-Nom Tap (%)
DATA for Transformer with ID. TF-2				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-A	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-B	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00
DATA for Transformer with ID. TF-1				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-A	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-A	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00
DATA for Transformer with ID. TF-3				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-B	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-C	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00
DATA for Transformer with ID. TF-4				No. of units	1 using library key TRANSFORMER							
6.6kV BUS-B	1	2.000	D	30.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0000	0.00
0.4kV BUS-D	2	2.000	YN	0.00	0.3110	2.4875	0.3110	2.4875	0.0000	0.0000	1.0500	0.00

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

INDUCTION MACHINE DATA

Busbar Identifier	Motor Identifier	No.Of Units	Library Key	Motor Ratings MVA	MW	kV	Input MW	Slip (%)	Stator R(pu)	X(pu)	Magnet. X(pu)	Standstill R(pu)	X(pu)	Rotor R(pu)	Running X(pu)	
0.4kV BUS-A	GLY RBOILER	1	GLY REBOILER	0.500	0.440	0.400	0.400	1.2000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
0.4kV BUS-B	SUPERHEATER1	1	SUPERHEATER	0.326	0.285	0.400	0.265	1.2193	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
0.4kV BUS-A	SUPERHEATER2	1	SUPERHEATER	0.326	0.285	0.400	0.269	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVIC
6.6kV BUS-A	SW-I PMP A	1	SW-I PMP	0.845	0.735	6.600	0.638	1.1325	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-A	SW-I PMP B	1	SW-I PMP	0.845	0.735	6.600	0.638	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVIC
6.6kV BUS-B	SW-I PMP C	1	SW-I PMP	0.845	0.735	6.600	0.638	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVIC
6.6kV BUS-A	SW-L PMP A	1	SW-L PMP	0.230	0.200	6.600	0.190	1.2391	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-A	SW-L PMP B	1	SW-L PMP	0.230	0.200	6.600	0.190	1.2391	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
6.6kV BUS-B	SW-L PMP C	1	SW-L PMP	0.230	0.200	6.600	0.190	100.0000	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVIC
MCC-1	COMP TRAIN-A	1	COMP TRAIN A	0.194	0.165	0.400	0.150	1.1598	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-2	COMP TRAIN-B	1	COMP TRAIN B	0.192	0.164	0.400	0.150	1.1719	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVIC
MCC-3	NORM PRCS LD	1	NORM PRCS LD	0.545	0.471	0.400	0.400	1.1009	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-4	COMP TRAIN-C	1	COMP TRAIN C	0.189	0.164	0.400	0.155	1.2302	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	NOT IN SERVIC
MCC-5	NORM PRCS LD	1	NORM PCS LD2	0.473	0.407	0.400	0.385	1.2209	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-6	MINI LQ & LD	1	MINI LQ & LD	0.305	0.263	0.400	0.243	1.1951	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-7	PLT VITAL LD	1	PLT VITAL LD	0.460	0.400	0.400	0.350	1.1413	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	
MCC-8	VTL MN LQ	1	VTL MN LQ	0.336	0.283	0.400	0.251	1.1205	0.0100	0.1000	3.5000	0.0200	0.1000	0.0150	0.1500	

SYNCHRONOUS MACHINE DATA

Busbar Identifier	Machine Identifier	Type	No.Of Units	Library Key	Generator Ratings MVA BASE	MW	kV	V(pu)	Assigned MW	MVAR	Pos. Sequence R(pu)	X(pu)	Neg. Sequence R(pu)	X(pu)	Zero Sequence R(pu)	X(pu)
6.6kV BUS-A	GTG-1 NC	SLACK	1	GEN SET	4.370	3.500	6.600	1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000
6.6kV BUS-A	GTG-2 NO	SLACK	1	GEN SET	4.370	NOT IN SERVICE		1.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000
6.6kV BUS-B	GTG-3 NC	SLACK	1	GEN SET	4.370	NOT IN SERVICE		0.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	2.8652	0.0000
0.4kV BUS-E	EDG	SLACK	1	DIESEL GEN	1.250	NOT IN SERVICE		0.000	0.000	0.000	0.0100	0.1000	0.0500	0.2400	0.0100	0.1500
					Neutral earthing						0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

BUS SECTION DATA

First Busbar	Second Busbar	Status
0.4kV BUS-C	0.4kV BUS-D	Closed
0.4kV BUS-A	0.4kV BUS-B	Closed
0.4kV BUS-D	0.4kV BUS-E	Closed
6.6kV BUS-A	6.6kV BUS-B	Closed

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

AT STUDY END - No of iterations = 5 Convergence = 0.1186E-04
Voltage Range from 1.000pu at 6.6kV BUS-A to 1.027pu at 0.4kV BUS-A

AC BUSBAR VALUES

Busbar Identifier	Merge	Busbar Type	Voltage PU	Voltage kV	Voltage ANG-DEG	Synch. Machines MW	Synch. Machines MVAr	Ind Motor Load MW	Ind Motor Load MVAr	Shunt Loads MW	Shunt Loads MVAr	3 Phase Fault kA	3 Phase Fault X/R	Ph - E Fault kA	Ph - E Fault X/R
6.6kV BUS-A	M1	SLACK	1.000	6.600	0.000	3.475	2.072	1.018	0.574	0.000	0.000	5.64	11.504	0.39	0.114
6.6kV BUS-B	M1	LOAD	1.000	6.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.64	11.504	0.39	0.114
0.4kV BUS-A	M2	LOAD	1.027	0.411	-1.644	0.000	0.000	0.400	0.227	0.000	0.000	43.35	10.605	42.89	9.309
0.4kV BUS-B	M2	LOAD	1.027	0.411	-1.644	0.000	0.000	0.265	0.150	0.000	0.000	43.35	10.605	42.89	9.309
0.4kV BUS-C	M3	LOAD	1.027	0.411	-1.664	0.000	0.000	0.000	0.000	0.000	0.000	43.40	10.610	42.92	9.312
0.4kV BUS-D	M3	LOAD	1.027	0.411	-1.664	0.000	0.000	0.000	0.000	0.000	0.000	43.40	10.610	42.92	9.312
0.4kV BUS-E	M3	LOAD	1.027	0.411	-1.664	0.000	0.000	0.000	0.000	0.000	0.000	43.40	10.610	42.92	9.312
MCC-1	.	LOAD	1.027	0.411	-1.645	0.000	0.000	0.150	0.086	0.000	0.000	43.22	10.335	42.76	9.101
MCC-3	.	LOAD	1.027	0.411	-1.645	0.000	0.000	0.400	0.233	0.000	0.000	43.24	10.371	42.77	9.122
MCC-5	.	LOAD	1.027	0.411	-1.665	0.000	0.000	0.385	0.217	0.000	0.000	43.28	10.368	42.80	9.120
MCC-6	.	LOAD	1.027	0.411	-1.664	0.000	0.000	0.243	0.138	0.000	0.000	43.27	10.351	42.79	9.110
MCC-7	.	LOAD	1.027	0.411	-1.665	0.000	0.000	0.350	0.201	0.000	0.000	43.28	10.367	42.80	9.119
MCC-8	.	LOAD	1.027	0.411	-1.664	0.000	0.000	0.251	0.145	0.000	0.000	43.28	10.354	42.79	9.112
MCC-2			BUS DISCONNECTED												
MCC-4			BUS DISCONNECTED												
BUSBAR TOTALS						3.475	2.072	3.462	1.969	0.000	0.000				
TOTAL BUS LOAD						3.462	1.969								
SYSTEM LOSSES						0.013	0.103								

CABLE VALUES

First Busbar	Second Busbar	Branch Identifier	No.Of Ccts	Rating kA	First End Flow MW	First End Flow MVAr	First End Flow kA	Second End Flow MW	Second End Flow MVAr	Second End Flow kA	Loading (%)	O/L FLAG
0.4kV BUS-A	MCC-1	CABLE-1	1	1.000	0.150	0.086	0.243	-0.150	-0.086	0.243	24.3	
0.4kV BUS-B	MCC-2	CABLE-2	1	BRANCH DISCONNECTED								
0.4kV BUS-B	MCC-3	CABLE-3	1	1.000	0.400	0.233	0.650	-0.400	-0.233	0.650	65.0	
0.4kV BUS-C	MCC-4	CABLE-4	1	BRANCH DISCONNECTED								
0.4kV BUS-C	MCC-5	CABLE-5	1	1.000	0.385	0.217	0.621	-0.385	-0.217	0.621	62.1	
0.4kV BUS-D	MCC-6	CABLE-6	1	1.000	0.243	0.138	0.393	-0.243	-0.138	0.393	39.3	
0.4kV BUS-E	MCC-7	CABLE-7	1	1.000	0.350	0.201	0.567	-0.350	-0.201	0.567	56.7	

ERAS Loadflow Module by ERA Technology Ltd. ERAS Version
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

CABLE VALUES

First Busbar	Second Busbar	Branch Identifier	No.Of Ccts	Rating kA	First End Flow MW	MVAr	kA	Second End Flow MW	MVAr	kA	Loading (%)	O/L FLAG
0.4kV BUS-E	MCC-8	CABLE-8	1	1.000	0.251	0.145	0.408	-0.251	-0.145	0.408	40.8	

TRANSFORMER VALUES

Transformer Identifier	No.Of Units	Winding No.	Connected Busbar	Winding kV	Voltage Ratio	Off Nominal Tap %	Rating MVA	Flow From Busbar MW	MVAr	Current kA	Percent Loading	O/L Flag
TF-2	1	1	6.6kV BUS-A	6.600	1.0000	0.000	2.000	0.611	0.373	0.063	35.8	
		2	0.4kV BUS-B	0.420	1.0500	0.000	2.000	-0.608	-0.347	0.984	35.0	
TF-1	1	1	6.6kV BUS-A	6.600	1.0000	0.000	2.000	0.611	0.373	0.063	35.8	
		2	0.4kV BUS-A	0.420	1.0500	0.000	2.000	-0.608	-0.347	0.984	35.0	
TF-3	1	1	6.6kV BUS-B	6.600	1.0000	0.000	2.000	0.618	0.377	0.063	36.2	
		2	0.4kV BUS-C	0.420	1.0500	0.000	2.000	-0.615	-0.351	0.995	35.4	
TF-4	1	1	6.6kV BUS-B	6.600	1.0000	0.000	2.000	0.618	0.377	0.063	36.2	
		2	0.4kV BUS-D	0.420	1.0500	0.000	2.000	-0.615	-0.351	0.995	35.4	

BRANCH LOSS SUMMARY

	(MW)	(MVAr)
SERIES LOSSES	0.013	0.103
SHUNT LOSSES	0.000	0.000
TOTAL LOSSES	0.013	0.103

INDUCTION MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Slip %	Terminal Voltage kV	Machine Input MW	MVAr	Current kA	O/L Flag
0.4kV BUS-A	GLY RBOILER	1	1.26	0.411	0.400	0.227	0.646	
0.4kV BUS-B	SUPERHEATER1	1	1.28	0.411	0.265	0.150	0.428	
0.4kV BUS-A	SUPERHEATER2	1	MACHINE DISCONNECTED					
6.6kV BUS-A	SW-I PMP A	1	1.26	6.600	0.638	0.362	0.064	

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2

INDUCTION MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Slip %	Terminal Voltage kV	Machine Input MW	MVAr	Current kA	O/L Flag
6.6kV BUS-A	SW-I PMP B	1	MACHINE DISCONNECTED					
6.6kV BUS-B	SW-I PMP C	1	MACHINE DISCONNECTED					
6.6kV BUS-A	SW-L PMP A	1	1.39	6.600	0.190	0.106	0.019	
6.6kV BUS-A	SW-L PMP B	1	1.39	6.600	0.190	0.106	0.019	
6.6kV BUS-B	SW-L PMP C	1	MACHINE DISCONNECTED					
MCC-1	COMP TRAIN-A	1	1.22	0.411	0.150	0.086	0.243	
MCC-2	COMP TRAIN-B	1	MACHINE DISCONNECTED					
MCC-3	NORM PRCS LD	1	1.15	0.411	0.400	0.233	0.650	
MCC-4	COMP TRAIN-C	1	MACHINE DISCONNECTED					
MCC-5	NORM PRCS LD	1	1.29	0.411	0.385	0.217	0.621	
MCC-6	MINI LQ & LD	1	1.26	0.411	0.243	0.138	0.393	
MCC-7	PLT VITAL LD	1	1.20	0.411	0.350	0.201	0.567	
MCC-8	VTL MN LQ	1	1.17	0.411	0.251	0.145	0.408	

SYNCHRONOUS MACHINE VALUES

Busbar Identifier	Machine Identifier	No.Of Units	Terminal Voltage kV	Power MW	Output MVAr	Current kA	O/L Flag
6.6kV BUS-A	GTG-1 NC	1	6.600	3.475	2.072	0.354	
6.6kV BUS-A	GTG-2 NO	1	MACHINE DISCONNECTED				
6.6kV BUS-B	GTG-3 NC	1	MACHINE DISCONNECTED				
0.4kV BUS-E	EDG	1	MACHINE DISCONNECTED				

BUS SECTION VALUES

First Busbar	Second Busbar	MW	MVAr	kA
0.4kV BUS-C	0.4kV BUS-D	0.230	0.133	0.373
0.4kV BUS-A	0.4kV BUS-B	0.058	0.035	0.094
0.4kV BUS-D	0.4kV BUS-E	0.601	0.346	0.975
6.6kV BUS-A	6.6kV BUS-B	1.236	0.753	0.127

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 6.6kV BUS-A

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
6.6kV BUS-A	9.668	0.000	0.000	9.668	9.668	9.668	0.000	110.521	Magnitude
	10.848	0.000	0.000	10.848	10.848	10.849	0.000		X/R Ratio
	-84.7	0.0	0.0	-84.7	155.3	35.3	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
6.6kV BUS-A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-2	6.6kV BUS-A	1	Winding disconnected.							
TF-1	6.6kV BUS-A	1	0.501	0.000	0.000	0.501	0.501	0.501	0.000	Magnitude
			81.1	0.0	0.0	81.1	-38.9	-158.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SW-I PMP A	6.6kV BUS-A	0.344	0.000	0.000	0.344	0.344	0.344	0.000	Magnitude
		-96.1	0.0	0.0	-96.1	143.9	23.9	0.0	Angle (deg)
SW-I PMP B	6.6kV BUS-A	0.344	0.000	0.000	0.344	0.344	0.344	0.000	Magnitude
		-96.1	0.0	0.0	-96.1	143.9	23.9	0.0	Angle (deg)
SW-L PMP A	6.6kV BUS-A	0.093	0.000	0.000	0.093	0.093	0.093	0.000	Magnitude
		-97.1	0.0	0.0	-97.1	142.9	22.9	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 6.6kV BUS-A

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SW-L PMP B	6.6kV BUS-A	0.093	0.000	0.000	0.093	0.093	0.093	0.000	Magnitude
		-97.1	0.0	0.0	-97.1	142.9	22.9	0.0	Angle (deg)

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GTG-1 NC	6.6kV BUS-A	3.941	0.000	0.000	3.941	3.941	3.941	0.000	Magnitude
		-81.7	0.0	0.0	-81.7	158.3	38.3	0.0	Angle (deg)
GTG-2 NO	6.6kV BUS-A	Machine disconnected.							

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VCB-1	6.6kV BUS-A	4.391	0.000	0.000	4.391	4.391	4.391	0.000	Magnitude
		96.5	0.0	0.0	96.5	-23.5	-143.5	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID GTG-1 NC	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)
Synchronous Machine with ID GTG-2 NO	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 6.6kV BUS-B

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
6.6kV BUS-B	9.668	0.000	0.000	9.668	9.668	9.668	0.000	110.521	Magnitude
	10.848	0.000	0.000	10.848	10.848	10.849	0.000		X/R Ratio
	-84.7	0.0	0.0	-84.7	155.3	35.3	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
6.6kV BUS-B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-3	6.6kV BUS-B	1	0.468	0.000	0.000	0.468	0.468	0.468	0.000	Magnitude
			81.4	0.0	0.0	81.4	-38.6	-158.6	0.0	Angle (deg)
TF-4	6.6kV BUS-B	1	Winding disconnected.							

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
SW-I PMP C	6.6kV BUS-B	Machine disconnected.						
SW-L PMP C	6.6kV BUS-B	Machine disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 6.6kV BUS-B

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GTG-3 NC	6.6kV BUS-B	3.941	0.000	0.000	3.941	3.941	3.941	0.000	Magnitude
		-81.7	0.0	0.0	-81.7	158.3	38.3	0.0	Angle (deg)

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VCB-1	6.6kV BUS-B	5.279	0.000	0.000	5.279	5.279	5.279	0.000	Magnitude
		-85.7	0.0	0.0	-85.7	154.3	34.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID GTG-3 NC	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-A	34.591	0.000	0.000	34.591	34.591	34.591	0.000	23.965	Magnitude
	10.608	0.000	0.000	10.608	10.607	10.608	0.000		X/R Ratio
	-88.4	0.0	0.0	-88.4	151.6	31.6	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-1	0.4kV BUS-A	1.296	0.000	0.000	1.296	1.296	1.296	0.000	Magnitude
		79.7	0.0	0.0	79.7	-40.3	-160.3	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-1	0.4kV BUS-A	2	23.234	0.000	0.000	23.234	23.234	23.234	0.000	Magnitude
			97.5	0.0	0.0	97.5	-22.5	-142.5	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-A

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GLY RBOILER	0.4kV BUS-A	3.335	0.000	0.000	3.335	3.335	3.335	0.000	Magnitude
		-100.6	0.0	0.0	-100.6	139.4	19.4	0.0	Angle (deg)
SUPERHEATER2	0.4kV BUS-A	Machine disconnected.							

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-1	0.4kV BUS-A	7.104	0.000	0.000	7.104	7.104	7.104	0.000	Magnitude
		79.8	0.0	0.0	79.8	-40.2	-160.2	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-1	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-B

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-B	34.591	0.000	0.000	34.591	34.591	34.591	0.000	23.965	Magnitude
	10.608	0.000	0.000	10.608	10.607	10.608	0.000		X/R Ratio
	-88.4	0.0	0.0	-88.4	151.6	31.6	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-2	0.4kV BUS-B	1.282	0.000	0.000	1.282	1.282	1.282	0.000	Magnitude
		79.6	0.0	0.0	79.6	-40.4	-160.4	0.0	Angle (deg)
CABLE-3	0.4kV BUS-B	3.650	0.000	0.000	3.650	3.650	3.650	0.000	Magnitude
		80.2	0.0	0.0	80.2	-39.8	-159.8	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
	0.4kV BUS-B	2	Winding disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-B

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SUPERHEATER1	0.4kV BUS-B	2.172	0.000	0.000	2.172	2.172	2.172	0.000	Magnitude
		-100.8	0.0	0.0	-100.8	139.2	19.2	0.0	Angle (deg)

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-1	0.4kV BUS-B	27.674	0.000	0.000	27.674	27.674	27.674	0.000	Magnitude
		-85.4	0.0	0.0	-85.4	154.6	34.6	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-2	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-C

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-C	33.470	0.000	0.000	33.470	33.470	33.470	0.000	23.189	Magnitude
	10.408	0.000	0.000	10.408	10.408	10.409	0.000		X/R Ratio
	-87.9	0.0	0.0	-87.9	152.1	32.1	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-4	On busbar 0.4kV BUS-C is disconnected.								
CABLE-5	0.4kV BUS-C	3.171	0.000	0.000	3.171	3.171	3.171	0.000	Magnitude
		79.7	0.0	0.0	79.7	-40.3	-160.3	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-3	0.4kV BUS-C	2	23.225	0.000	0.000	23.225	23.225	23.225	0.000	Magnitude
			97.5	0.0	0.0	97.5	-22.5	-142.5	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-C

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-2	0.4kV BUS-C	7.406	0.000	0.000	7.406	7.406	7.406	0.000	Magnitude
		80.3	0.0	0.0	80.3	-39.7	-159.7	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transforme: with ID TF-3	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-D

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-D	33.470	0.000	0.000	33.470	33.470	33.470	0.000	23.189	Magnitude
	10.408	0.000	0.000	10.408	10.408	10.409	0.000		X/R Ratio
	-87.9	0.0	0.0	-87.9	152.1	32.1	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-6	0.4kV BUS-D	2.047	0.000	0.000	2.047	2.047	2.047	0.000	Magnitude
		79.9	0.0	0.0	79.9	-40.1	-160.1	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
	0.4kV BUS-D	2	Winding disconnected.						

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-D

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-2	0.4kV BUS-D	26.263	0.000	0.000	26.263	26.263	26.263	0.000	Magnitude
		-84.6	0.0	0.0	-84.6	155.4	35.4	0.0	Angle (deg)
BUS SECTION	0.4kV BUS-D	5.358	0.000	0.000	5.358	5.358	5.358	0.000	Magnitude
		80.5	0.0	0.0	80.5	-39.5	-159.5	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-4	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-E	33.470	0.000	0.000	33.470	33.470	33.470	0.000	23.189	Magnitude
	10.408	0.000	0.000	10.408	10.408	10.409	0.000		X/R Ratio
	-87.9	0.0	0.0	-87.9	152.1	32.1	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-E	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-7	0.4kV BUS-E	3.095	0.000	0.000	3.095	3.095	3.095	0.000	Magnitude
		80.4	0.0	0.0	80.4	-39.6	-159.6	0.0	Angle (deg)
CABLE-8	0.4kV BUS-E	2.263	0.000	0.000	2.263	2.263	2.263	0.000	Magnitude
		80.6	0.0	0.0	80.6	-39.4	-159.4	0.0	Angle (deg)

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
EDG	0.4kV BUS-E	Machine disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.0.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar 0.4kV BUS-E

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
BUS SECTION	0.4kV BUS-E	28.242	0.000	0.000	28.242	28.242	28.242	0.000	Magnitude
		-85.7	0.0	0.0	-85.7	154.3	34.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID EDG	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS version: 3.3.0. Fault version: 3.0.0

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor

Network Name : SUMANDAK Phase 2_070507

Data State Name : SUPG-B_NORM

Study Name : Three phase fault at busbar MCC-1

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-1	34.507	0.000	0.000	34.507	34.507	34.507	0.000	23.907	Magnitude
	10.388	0.000	0.000	10.388	10.387	10.388	0.000		X/R Ratio
	-88.3	0.0	0.0	-88.3	151.7	31.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-1	MCC-1	33.240	0.000	0.000	33.240	33.240	33.240	0.000	Magnitude
		92.1	0.0	0.0	92.1	-27.9	-147.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
COMP TRAIN-A	MCC-1	1.296	0.000	0.000	1.296	1.296	1.296	0.000	Magnitude
		-100.3	0.0	0.0	-100.3	139.7	19.7	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-2

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-2	34.507	0.000	0.000	34.507	34.507	34.507	0.000	23.907	Magnitude
	10.387	0.000	0.000	10.387	10.387	10.388	0.000		X/R Ratio
	-88.3	0.0	0.0	-88.3	151.7	31.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-2	MCC-2	33.254	0.000	0.000	33.254	33.254	33.254	0.000	Magnitude
		92.1	0.0	0.0	92.1	-27.9	-147.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
COMP TRAIN-B	MCC-2	1.282	0.000	0.000	1.282	1.282	1.282	0.000	Magnitude
		-100.4	0.0	0.0	-100.4	139.6	19.6	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-3

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-3	34.518	0.000	0.000	34.518	34.518	34.518	0.000	23.915	Magnitude
	10.424	0.000	0.000	10.424	10.424	10.425	0.000		X/R Ratio
	-88.3	0.0	0.0	-88.3	151.7	31.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-3	0.00	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-3	MCC-3	30.948	0.000	0.000	30.948	30.948	30.948	0.000	Magnitude
		93.0	0.0	0.0	93.0	-27.0	-147.0	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
NORM PRCS LD	MCC-3	3.651	0.000	0.000	3.651	3.651	3.651	0.000	Magnitude
		-99.8	0.0	0.0	-99.8	140.2	20.2	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-4

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	10.424	0.000	0.000	10.424	10.424	10.425	0.000		X/R Ratio
	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
CABLE-4	On busbar MCC-4	is disconnected.						

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
COMP TRAIN-C	MCC-4	Machine disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-5

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-5	33.401	0.000	0.000	33.401	33.401	33.401	0.000	23.141	Magnitude
	10.233	0.000	0.000	10.233	10.233	10.234	0.000		X/R Ratio
	-87.8	0.0	0.0	-87.8	152.2	32.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-5	0.00	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-5	MCC-5	30.311	0.000	0.000	30.311	30.311	30.311	0.000	Magnitude
		93.5	0.0	0.0	93.5	-26.5	-146.5	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
NORM PRCS LD	MCC-5	3.172	0.000	0.000	3.172	3.172	3.172	0.000	Magnitude
		-100.3	0.0	0.0	-100.3	139.7	19.7	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-6

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-6	33.395	0.000	0.000	33.395	33.395	33.395	0.000	23.137	Magnitude
	10.216	0.000	0.000	10.216	10.216	10.217	0.000		X/R Ratio
	-87.8	0.0	0.0	-87.8	152.2	32.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-6	MCC-6	31.397	0.000	0.000	31.397	31.397	31.397	0.000	Magnitude
		93.0	0.0	0.0	93.0	-27.0	-147.0	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
MINI LQ & LD	MCC-6	2.048	0.000	0.000	2.048	2.048	2.048	0.000	Magnitude
		-100.1	0.0	0.0	-100.1	139.9	19.9	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-7

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-7	33.400	0.000	0.000	33.400	33.400	33.400	0.000	23.140	Magnitude
	10.232	0.000	0.000	10.232	10.232	10.233	0.000		X/R Ratio
	-87.8	0.0	0.0	-87.8	152.2	32.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-7	MCC-7	30.376	0.000	0.000	30.376	30.376	30.376	0.000	Magnitude
		93.4	0.0	0.0	93.4	-26.6	-146.6	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
PLT VITAL LD	MCC-7	3.096	0.000	0.000	3.096	3.096	3.096	0.000	Magnitude
		-99.6	0.0	0.0	-99.6	140.4	20.4	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_NORM
Study Name : Three phase fault at busbar MCC-8

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-8	33.396	0.000	0.000	33.396	33.396	33.396	0.000	23.138	Magnitude
	10.220	0.000	0.000	10.220	10.219	10.220	0.000		X/R Ratio
	-87.8	0.0	0.0	-87.8	152.2	32.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

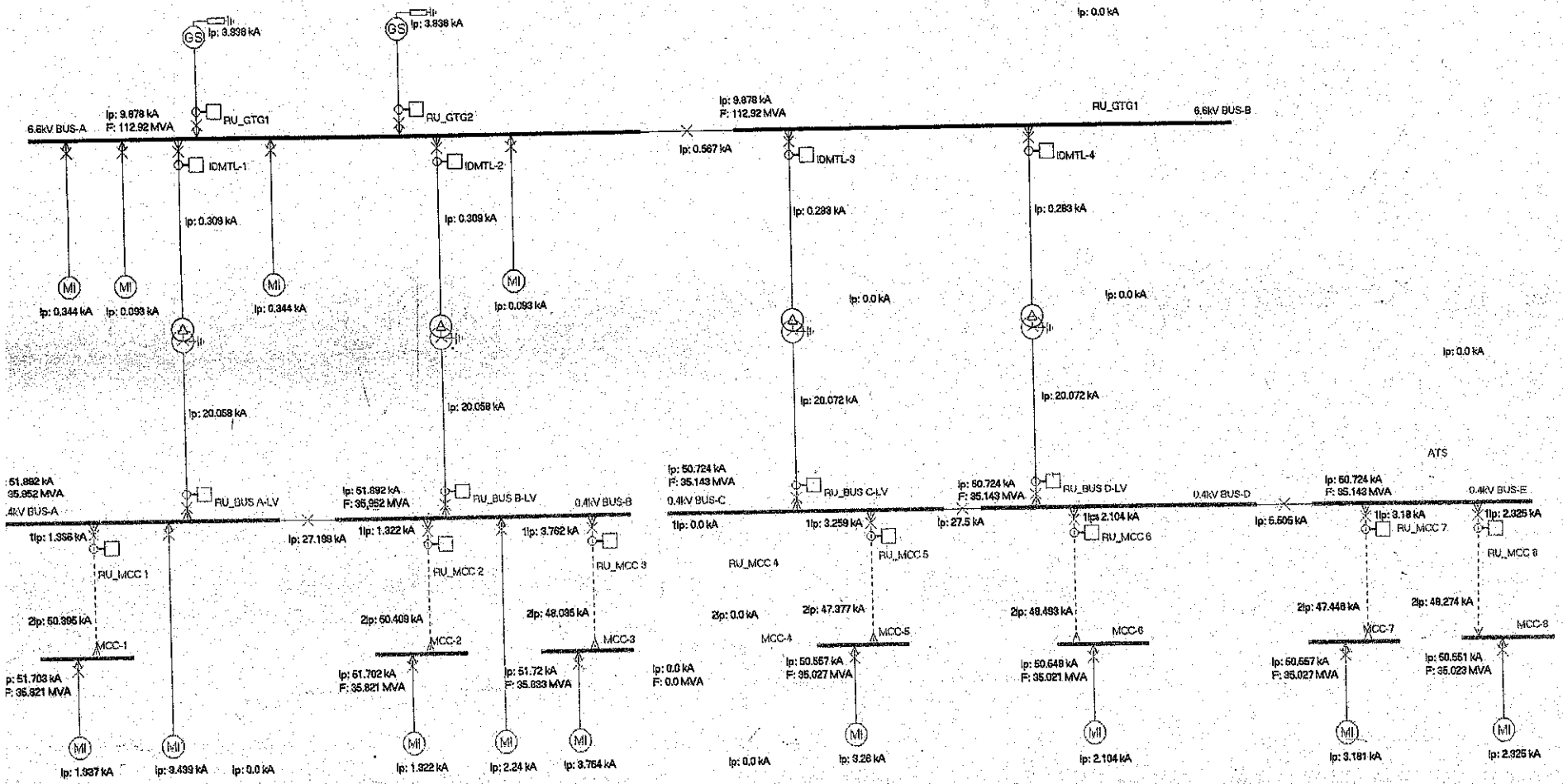
Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-8	MCC-8	31.182	0.000	0.000	31.182	31.182	31.182	0.000	Magnitude
		93.0	0.0	0.0	93.0	-27.0	-147.0	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VTL MN LQ	MCC-8	2.264	0.000	0.000	2.264	2.264	2.264	0.000	Magnitude
		-99.4	0.0	0.0	-99.4	140.6	20.6	0.0	Angle (deg)

APPENDIX G

ERACS SHORT CIRCUIT PRINTOUTS – SCENARIO 2


Ip: 0.0 kA
GS
Ip: 3.938 kA
GS
Ip: 3.938 kA
Ip: 9.878 kA
F: 112.92 MVA
6.6kV BUS-A
RU_GTG1
RU_GTG2
Ip: 9.878 kA
F: 112.92 MVA
RU_GTG1
6.6kV BUS-B
Ip: 0.567 kA
IDMTL-1
IDMTL-2
IDMTL-3
IDMTL-4
Ip: 0.309 kA
Ip: 0.309 kA
Ip: 0.283 kA
Ip: 0.283 kA
MI
Ip: 0.344 kA
Ip: 0.093 kA
Ip: 0.344 kA
Ip: 0.093 kA
Ip: 0.0 kA
Ip: 0.0 kA
Ip: 0.0 kA
Ip: 20.058 kA
Ip: 20.058 kA
Ip: 20.072 kA
Ip: 20.072 kA
ATS
51.892 kA
35.952 MVA
.4KV BUS-A
RU_BUS A-LV
Ip: 51.892 kA
F: 35.952 MVA
RU_BUS B-LV
0.4kV BUS-B
Ip: 50.724 kA
F: 35.143 MVA
0.4kV BUS-C
RU_BUS C-LV
Ip: 50.724 kA
F: 35.143 MVA
RU_BUS D-LV
0.4kV BUS-D
Ip: 50.724 kA
F: 35.143 MVA
0.4kV BUS-E
1Ip: 1.356 kA
Ip: 27.199 kA
1Ip: 1.322 kA
1Ip: 3.762 kA
1Ip: 0.0 kA
1Ip: 3.259 kA
Ip: 27.5 kA
1Ip: 2.104 kA
Ip: 6.505 kA
1Ip: 3.18 kA
1Ip: 2.325 kA
RU_MCC 1
RU_MCC 2
RU_MCC 3
RU_MCC 4
RU_MCC 5
RU_MCC 6
RU_MCC 7
RU_MCC 8
2Ip: 50.395 kA
2Ip: 50.409 kA
2Ip: 48.095 kA
2Ip: 0.0 kA
2Ip: 47.377 kA
2Ip: 48.493 kA
2Ip: 47.448 kA
2Ip: 48.274 kA
MCC-1
MCC-2
MCC-3
MCC-4
MCC-5
MCC-6
MCC-7
MCC-8
p: 51.703 kA
P: 35.821 MVA
Ip: 51.702 kA
F: 35.821 MVA
Ip: 51.72 kA
F: 35.833 MVA
Ip: 0.0 kA
F: 0.0 MVA
Ip: 50.557 kA
F: 35.027 MVA
Ip: 50.648 kA
F: 35.021 MVA
Ip: 50.557 kA
F: 35.027 MVA
Ip: 50.551 kA
F: 35.023 MVA
Ip: 1.937 kA
Ip: 9.439 kA
Ip: 0.0 kA
Ip: 1.322 kA
Ip: 2.24 kA
Ip: 3.764 kA
Ip: 0.0 kA
Ip: 3.26 kA
Ip: 2.104 kA
Ip: 3.181 kA
Ip: 2.325 kA

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : 3 Phase Fault Study: SUPG-B_SCN1

FAULT IMPEDANCE VALUES

Rph(pu)	Rph(ohm)	Xph(pu)	Xph(ohm)	Rgnd(pu)	Rgnd(ohm)	Xgnd(pu)	Xgnd(ohm)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

REACTANCE SELECTION: Synchronous machine Positive Sequence reactance is employed and asynchronous machines are included in the system model.

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 6.6kV BUS-A

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
6.6kV BUS-A	9.878	0.000	0.000	9.878	9.878	9.878	0.000	112.915	Magnitude
	11.047	0.000	0.000	11.047	11.046	11.047	0.000		X/R Ratio
	-84.8	0.0	0.0	-84.8	155.2	35.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
6.6kV BUS-A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-2	6.6kV BUS-A	1	0.309	0.000	0.000	0.309	0.309	0.309	0.000	Magnitude
			83.0	0.0	0.0	83.0	-37.0	-157.0	0.0	Angle (deg)
TF-1	6.6kV BUS-A	1	0.309	0.000	0.000	0.309	0.309	0.309	0.000	Magnitude
			83.0	0.0	0.0	83.0	-37.0	-157.0	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SW-I PMP A	6.6kV BUS-A	0.344	0.000	0.000	0.344	0.344	0.344	0.000	Magnitude
		-96.1	0.0	0.0	-96.1	143.9	23.9	0.0	Angle (deg)
SW-I PMP B	6.6kV BUS-A	0.344	0.000	0.000	0.344	0.344	0.344	0.000	Magnitude
		-96.1	0.0	0.0	-96.1	143.9	23.9	0.0	Angle (deg)
SW-L PMP A	6.6kV BUS-A	0.093	0.000	0.000	0.093	0.093	0.093	0.000	Magnitude
		-97.1	0.0	0.0	-97.1	142.9	22.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SW-L PMP B	6.6kV BUS-A	0.093	0.000	0.000	0.093	0.093	0.093	0.000	Magnitude
		-97.1	0.0	0.0	-97.1	142.9	22.9	0.0	Angle (deg)

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GTG-1 NC	6.6kV BUS-A	3.936	0.000	0.000	3.936	3.936	3.936	0.000	Magnitude
		-81.7	0.0	0.0	-81.7	158.3	38.3	0.0	Angle (deg)
GTG-2 NO	6.6kV BUS-A	3.936	0.000	0.000	3.936	3.936	3.936	0.000	Magnitude
		-81.7	0.0	0.0	-81.7	158.3	38.3	0.0	Angle (deg)

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VCB-1	6.6kV BUS-A	0.567	0.000	0.000	0.567	0.567	0.567	0.000	Magnitude
		83.1	0.0	0.0	83.1	-36.9	-156.9	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID GTG-1 NC	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)
Synchronous Machine with ID GTG-2 NO	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 6.6kV BUS-B

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
6.6kV BUS-B	9.878	0.000	0.000	9.878	9.878	9.878	0.000	112.915	Magnitude
	11.047	0.000	0.000	11.047	11.046	11.047	0.000		X/R Ratio
	-84.8	0.0	0.0	-84.8	155.2	35.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
6.6kV BUS-B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-3	6.6kV BUS-B	1	0.283	0.000	0.000	0.283	0.283	0.283	0.000	Magnitude
			83.1	0.0	0.0	83.1	-36.9	-156.9	0.0	Angle (deg)
TF-4	6.6kV BUS-B	1	0.283	0.000	0.000	0.283	0.283	0.283	0.000	Magnitude
			83.1	0.0	0.0	83.1	-36.9	-156.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
SW-I PMP C	6.6kV BUS-B	Machine disconnected.						
SW-L PMP C	6.6kV BUS-B	Machine disconnected.						

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 6.6kV BUS-B

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
GTG-3 NC	6.6kV BUS-B	Machine disconnected.						

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VCB-1	6.6kV BUS-B	9.324	0.000	0.000	9.324	9.324	9.324	0.000	Magnitude
		-84.1	0.0	0.0	-84.1	155.9	35.9	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID GTG-3 NC	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-A	51.892	0.000	0.000	51.892	51.892	51.892	0.000	35.952	Magnitude
	10.056	0.000	0.000	10.056	10.056	10.057	0.000		X/R Ratio
	-86.2	0.0	0.0	-86.2	153.8	33.8	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-1	0.4kV BUS-A	1.336	0.000	0.000	1.336	1.336	1.336	0.000	Magnitude
		82.2	0.0	0.0	82.2	-37.8	-157.8	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-1	0.4kV BUS-A	2	20.058	0.000	0.000	20.058	20.058	20.058	0.000	Magnitude
			97.3	0.0	0.0	97.3	-22.7	-142.7	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GLY RBOILER	0.4kV BUS-A	3.439	0.000	0.000	3.439	3.439	3.439	0.000	Magnitude
		-98.1	0.0	0.0	-98.1	141.9	21.9	0.0	Angle (deg)
SUPERHEATER2	0.4kV BUS-A	Machine disconnected.							

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-1	0.4kV BUS-A	27.199	0.000	0.000	27.199	27.199	27.199	0.000	Magnitude
		93.3	0.0	0.0	93.3	-26.7	-146.7	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-1	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 0.4kV BUS-B

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-B	51.892	0.000	0.000	51.892	51.892	51.892	0.000	35.952	Magnitude
	10.056	0.000	0.000	10.056	10.056	10.057	0.000		X/R Ratio
	-86.2	0.0	0.0	-86.2	153.8	33.8	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-2	0.4kV BUS-B	1.322	0.000	0.000	1.322	1.322	1.322	0.000	Magnitude
		82.1	0.0	0.0	82.1	-37.9	-157.9	0.0	Angle (deg)
CABLE-3	0.4kV BUS-B	3.762	0.000	0.000	3.762	3.762	3.762	0.000	Magnitude
		82.7	0.0	0.0	82.7	-37.3	-157.3	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-2	0.4kV BUS-B	2	20.058	0.000	0.000	20.058	20.058	20.058	0.000	Magnitude
			97.3	0.0	0.0	97.3	-22.7	-142.7	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SUPERHEATER1	0.4kV BUS-B	2.240	0.000	0.000	2.240	2.240	2.240	0.000	Magnitude
		-98.3	0.0	0.0	-98.3	141.7	21.7	0.0	Angle (deg)

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-1	0.4kV BUs-B	24.695	0.000	0.000	24.695	24.695	24.695	0.000	Magnitude
		-85.6	0.0	0.0	-85.6	154.4	34.4	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-2	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0.
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 0.4kV BUS-C

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-C	50.724	0.000	0.000	50.724	50.724	50.724	0.000	35.143	Magnitude
	9.919	0.000	0.000	9.919	9.918	9.919	0.000		X/R Ratio
	-85.9	0.0	0.0	-85.9	154.1	34.1	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-4	On busbar 0.4kV BUS-C is disconnected.								
CABLE-5	0.4kV BUS-C	3.259	0.000	0.000	3.259	3.259	3.259	0.000	Magnitude
		82.0	0.0	0.0	82.0	-38.0	-158.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-3	0.4kV BUS-C	2	20.072	0.000	0.000	20.072	20.072	20.072	0.000	Magnitude
			97.2	0.0	0.0	97.2	-22.8	-142.8	0.0	Angle (deg)

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 0.4kV BUS-C

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-2	0.4kV BUS-C	27.500	0.000	0.000	27.500	27.500	27.500	0.000	Magnitude
		93.2	0.0	0.0	93.2	-26.8	-146.8	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-3	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 0.4kV BUS-D

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-D	50.724	0.000	0.000	50.724	50.724	50.724	0.000	35.143	Magnitude
	9.919	0.000	0.000	9.919	9.918	9.919	0.000		X/R Ratio
	-85.9	0.0	0.0	-85.9	154.1	34.1	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-6	0.4kV BUS-D	2.104	0.000	0.000	2.104	2.104	2.104	0.000	Magnitude
		82.2	0.0	0.0	82.2	-37.8	-157.8	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-4	0.4kV BUS-D	2	20.072	0.000	0.000	20.072	20.072	20.072	0.000	Magnitude
			97.2	0.0	0.0	97.2	-22.8	-142.8	0.0	Angle (deg)

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar 0.4kV BUS-D

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-2	0.4kV BUS-D	23.232	0.000	0.000	23.232	23.232	23.232	0.000	Magnitude
		-84.9	0.0	0.0	-84.9	155.1	35.1	0.0	Angle (deg)
BUS SECTION	0.4kV BUS-D	5.505	0.000	0.000	5.505	5.505	5.505	0.000	Magnitude
		82.7	0.0	0.0	82.7	-37.3	-157.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-4	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-E	50.724	0.000	0.000	50.724	50.724	50.724	0.000	35.143	Magnitude
	9.919	0.000	0.000	9.919	9.918	9.919	0.000		X/R Ratio
	-85.9	0.0	0.0	-85.9	154.1	34.1	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-E	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-7	0.4kV BUS-E	3.180	0.000	0.000	3.180	3.180	3.180	0.000	Magnitude
		82.6	0.0	0.0	82.6	-37.4	-157.4	0.0	Angle (deg)
CABLE-8	0.4kV BUS-E	2.325	0.000	0.000	2.325	2.325	2.325	0.000	Magnitude
		82.8	0.0	0.0	82.8	-37.2	-157.2	0.0	Angle (deg)

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
EDG	0.4kV BUS-E	Machine disconnected.						

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
BUS SECTION	0.4kV BUS-E	45.341	0.000	0.000	45.341	45.341	45.341	0.000	Magnitude
		-84.5	0.0	0.0	-84.5	155.5	35.5	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID EDG	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

LT CURRENTS

ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
-1	51.703	0.000	0.000	51.703	51.703	51.703	0.000	35.821	Magnitude
	9.764	0.000	0.000	9.764	9.763	9.764	0.000		X/R Ratio
	-86.0	0.0	0.0	-86.0	154.0	34.0	0.0		Angle (deg)

BAR VOLTAGES

ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
-1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

LE CURRENTS

le ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
LE-1	MCC-1	50.395	0.000	0.000	50.395	50.395	50.395	0.000	Magnitude
		94.3	0.0	0.0	94.3	-25.7	-145.7	0.0	Angle (deg)

UCTION MACHINE CURRENTS

ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
IP TRAIN-A	MCC-1	1.337	0.000	0.000	1.337	1.337	1.337	0.000	Magnitude
		-97.8	0.0	0.0	-97.8	142.2	22.2	0.0	Angle (deg)

ULT CURRENTS

s ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
C-2	51.702	0.000	0.000	51.702	51.702	51.702	0.000	35.821	Magnitude
	9.764	0.000	0.000	9.764	9.763	9.764	0.000		X/R Ratio
	-86.0	0.0	0.0	-86.0	154.0	34.0	0.0		Angle (deg)

SBAR VOLTAGES

s ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
C-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

BLE CURRENTS

ole ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
BLE-2	MCC-2	50.409	0.000	0.000	50.409	50.409	50.409	0.000	Magnitude
		94.3	0.0	0.0	94.3	-25.7	-145.7	0.0	Angle (deg)

DUCTION MACHINE CURRENTS

ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
MP TRAIN-B	MCC-2	1.322	0.000	0.000	1.322	1.322	1.322	0.000	Magnitude
		-97.9	0.0	0.0	-97.9	142.1	22.1	0.0	Angle (deg)

JLT CURRENTS

ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
C-3	51.720	0.000	0.000	51.720	51.720	51.720	0.000	35.833	Magnitude
	9.796	0.000	0.000	9.796	9.796	9.797	0.000		X/R Ratio
	-86.0	0.0	0.0	-86.0	154.0	34.0	0.0		Angle (deg)

SBAR VOLTAGES

ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
C-3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

ULT CURRENTS

ult ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ULT-3	MCC-3	48.035	0.000	0.000	48.035	48.035	48.035	0.000	Magnitude
		94.9	0.0	0.0	94.9	-25.1	-145.1	0.0	Angle (deg)

DUCTION MACHINE CURRENTS

ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
M PRCS LD	MCC-3	3.764	0.000	0.000	3.764	3.764	3.764	0.000	Magnitude
		-97.3	0.0	0.0	-97.3	142.7	22.7	0.0	Angle (deg)

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar MCC-4

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	9.796	0.000	0.000	9.796	9.796	9.797	0.000		X/R Ratio
	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
CABLE-4	On busbar MCC-4	is disconnected.						

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
COMP TRAIN-C	MCC-4	Machine disconnected.						

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar MCC-5

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-5	50.557	0.000	0.000	50.557	50.557	50.557	0.000	35.027	Magnitude
	9.667	0.000	0.000	9.667	9.667	9.667	0.000		X/R Ratio
	-85.8	0.0	0.0	-85.8	154.2	34.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-5	MCC-5	47.377	0.000	0.000	47.377	47.377	47.377	0.000	Magnitude
		95.1	0.0	0.0	95.1	-24.9	-144.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
NORM PRCS LD	MCC-5	3.260	0.000	0.000	3.260	3.260	3.260	0.000	Magnitude
		-98.0	0.0	0.0	-98.0	142.0	22.0	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar MCC-6

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-6	50.549	0.000	0.000	50.549	50.549	50.549	0.000	35.021	Magnitude
	9.652	0.000	0.000	9.652	9.651	9.652	0.000		X/R Ratio
	-85.7	0.0	0.0	-85.7	154.3	34.3	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-6	MCC-6	48.493	0.000	0.000	48.493	48.493	48.493	0.000	Magnitude
		94.8	0.0	0.0	94.8	-25.2	-145.2	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
MINI LQ & LD	MCC-6	2.104	0.000	0.000	2.104	2.104	2.104	0.000	Magnitude
		-97.8	0.0	0.0	-97.8	142.2	22.2	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar MCC-7

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-7	50.557	0.000	0.000	50.557	50.557	50.557	0.000	35.027	Magnitude
	9.666	0.000	0.000	9.666	9.665	9.666	0.000		X/R Ratio
	-85.8	0.0	0.0	-85.8	154.2	34.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-7	MCC-7	47.446	0.000	0.000	47.446	47.446	47.446	0.000	Magnitude
		95.0	0.0	0.0	95.0	-25.0	-145.0	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
PLT VITAL LD	MCC-7	3.181	0.000	0.000	3.181	3.181	3.181	0.000	Magnitude
		-97.4	0.0	0.0	-97.4	142.6	22.6	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN1
Study Name : Three phase fault at busbar MCC-8

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-8	50.551	0.000	0.000	50.551	50.551	50.551	0.000	35.023	Magnitude
	9.655	0.000	0.000	9.655	9.654	9.655	0.000		X/R Ratio
	-85.8	0.0	0.0	-85.8	154.2	34.2	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

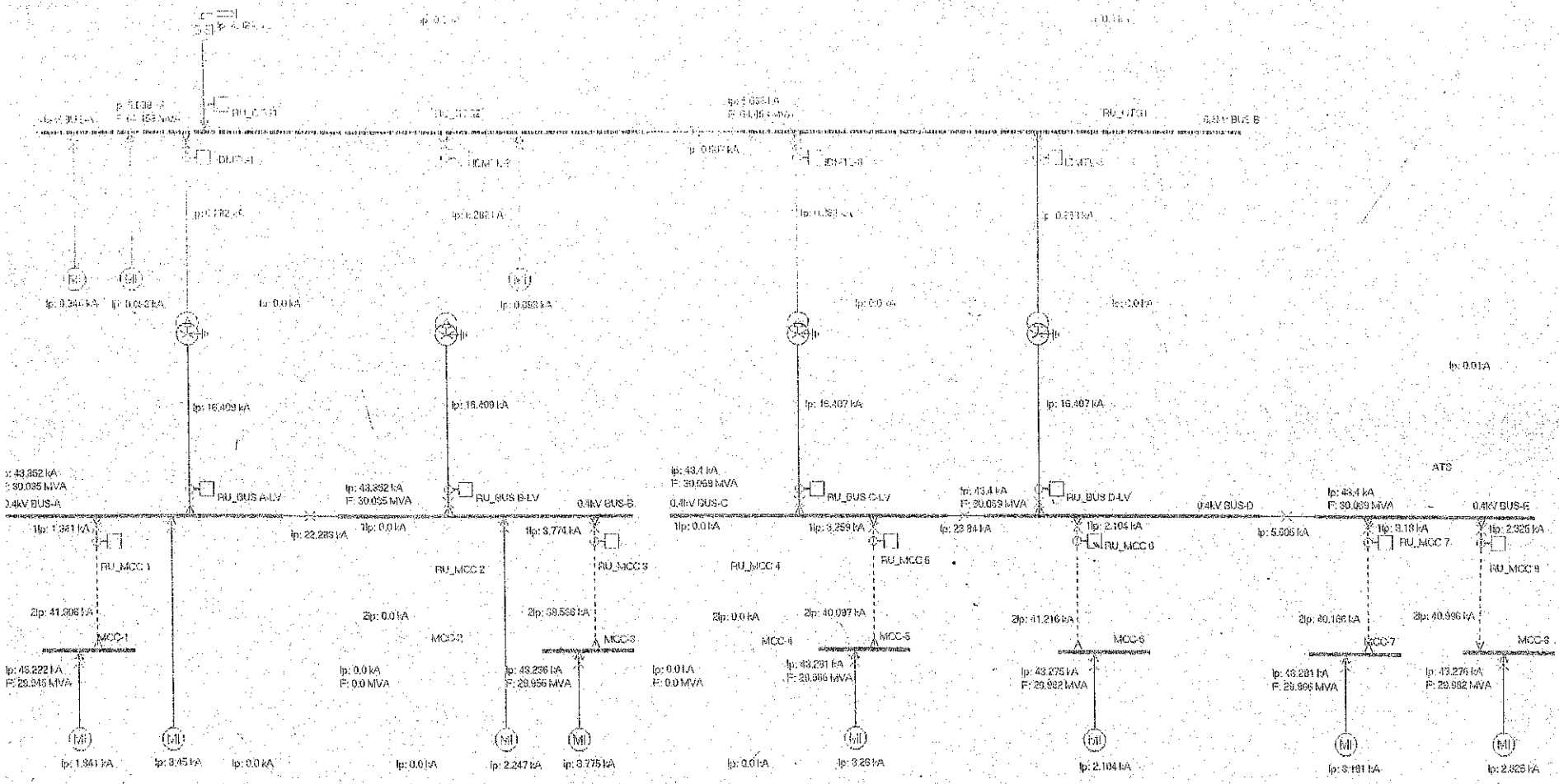
Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-8	MCC-8	48.274	0.000	0.000	48.274	48.274	48.274	0.000	Magnitude
		94.8	0.0	0.0	94.8	-25.2	-145.2	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VTL MN LQ	MCC-8	2.325	0.000	0.000	2.325	2.325	2.325	0.000	Magnitude
		-97.2	0.0	0.0	-97.2	142.8	22.8	0.0	Angle (deg)

APPENDIX H

ERACS LOAD FLOW PRINTOUTS – SCENARIO 3


RU_BUS A-LV
RU_BUS B-LV
RU_BUS C-LV
RU_BUS D-LV
0.4kV BUS-A
0.4kV BUS-B
0.4kV BUS-C
0.4kV BUS-D
0.4kV BUS-E
ATS
RU_MCC 1
RU_MCC 2
RU_MCC 3
RU_MCC 4
RU_MCC 5
RU_MCC 6
RU_MCC 7
RU_MCC 8
MCC-1
MCC-2
MCC-3
MCC-4
MCC-5
MCC-6
MCC-7
MCC-8
Ip: 16.409 kA
Ip: 16.407 kA
Ip: 43.352 kA
P: 30.035 MVA
Ip: 43.4 kA
P: 30.059 MVA
Ip: 22.283 kA
Ip: 23.84 kA
Ip: 5.606 kA
Ip: 0.01kA
Ip: 0.0 kA
Ip: 1.941 kA
Ip: 3.45 kA
Ip: 3.774 kA
Ip: 3.259 kA
Ip: 2.104 kA
Ip: 3.18 kA
Ip: 2.925 kA
2Ip: 41.806 kA
2Ip: 39.568 kA
2Ip: 40.097 kA
2Ip: 41.216 kA
2Ip: 40.166 kA
2Ip: 40.996 kA
Ip: 43.222 kA
P: 29.945 MVA
Ip: 43.236 kA
P: 29.956 MVA
Ip: 43.291 kA
P: 29.996 MVA
Ip: 43.275 kA
P: 29.982 MVA
Ip: 43.281 kA
P: 29.986 MVA
Ip: 43.276 kA
P: 29.982 MVA
Ip: 1.941 kA
Ip: 3.45 kA
Ip: 2.247 kA
Ip: 3.775 kA
Ip: 3.26 kA
Ip: 2.104 kA
Ip: 3.181 kA
Ip: 2.925 kA

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : 3 Phase Fault Study: SUPG-B_SCN2

FAULT IMPEDANCE VALUES

Rph(pu)	Rph(ohm)	Xph(pu)	Xph(ohm)	Rgnd(pu)	Rgnd(ohm)	Xgnd(pu)	Xgnd(ohm)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

REACTANCE SELECTION: Synchronous machine Positive Sequence reactance is employed and asynchronous machines are included in the system model.

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 6.6kV BUS-A

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
6.6kV BUS-A	5.638	0.000	0.000	5.638	5.638	5.638	0.000	64.453	Magnitude
	11.504	0.000	0.000	11.504	11.504	11.505	0.000		X/R Ratio
	-85.0	0.0	0.0	-85.0	155.0	35.0	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
6.6kV BUS-A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-2	6.6kV BUS-A	1	0.282	0.000	0.000	0.282	0.282	0.282	0.000	Magnitude
			83.2	0.0	0.0	83.2	-36.8	-156.8	0.0	Angle (deg)
TF-1	6.6kV BUS-A	1	0.282	0.000	0.000	0.282	0.282	0.282	0.000	Magnitude
			83.2	0.0	0.0	83.2	-36.8	-156.8	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SW-I PMP A	6.6kV BUS-A	0.344	0.000	0.000	0.344	0.344	0.344	0.000	Magnitude
		-96.1	0.0	0.0	-96.1	143.9	23.9	0.0	Angle (deg)
SW-I PMP B	6.6kV BUS-A	Machine disconnected.							
SW-L PMP A	6.6kV BUS-A	0.093	0.000	0.000	0.093	0.093	0.093	0.000	Magnitude
		-97.1	0.0	0.0	-97.1	142.9	22.9	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 6.6kV BUS-A

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SW-L PMP B	6.6kV BUS-A	0.093	0.000	0.000	0.093	0.093	0.093	0.000	Magnitude
		-97.1	0.0	0.0	-97.1	142.9	22.9	0.0	Angle (deg)

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GTG-1 NC	6.6kV BUS-A	4.024	0.000	0.000	4.024	4.024	4.024	0.000	Magnitude
		-80.2	0.0	0.0	-80.2	159.8	39.8	0.0	Angle (deg)
GTG-2 NO	6.6kV BUS-A	Machine disconnected.							

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VCB-1	6.6kV BUS-A	0.567	0.000	0.000	0.567	0.567	0.567	0.000	Magnitude
		83.1	0.0	0.0	83.1	-36.9	-156.9	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID GTG-1 NC	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)
Synchronous Machine with ID GTG-2 NO	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
6.6kV BUS-B	5.638	0.000	0.000	5.638	5.638	5.638	0.000	64.453	Magnitude
	11.504	0.000	0.000	11.504	11.504	11.505	0.000		X/R Ratio
	-85.0	0.0	0.0	-85.0	155.0	35.0	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
6.6kV BUS-B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-3	6.6kV BUS-B	1	0.283	0.000	0.000	0.283	0.283	0.283	0.000	Magnitude
			83.1	0.0	0.0	83.1	-36.9	-156.9	0.0	Angle (deg)
TF-4	6.6kV BUS-B	1	0.283	0.000	0.000	0.283	0.283	0.283	0.000	Magnitude
			83.1	0.0	0.0	83.1	-36.9	-156.9	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
SW-I PMP C	6.6kV BUS-B	Machine disconnected.						
SW-L PMP C	6.6kV BUS-B	Machine disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 6.6kV BUS-B

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
GTG-3 NC	6.6kV BUS-B	Machine disconnected.						

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
VCB-1	6.6kV BUS-B	5.085	0.000	0.000	5.085	5.085	5.085	0.000	Magnitude
		-83.7	0.0	0.0	-83.7	156.3	36.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID GTG-3 NC	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-A

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-A	43.352	0.000	0.000	43.352	43.352	43.352	0.000	30.035	Magnitude
	10.605	0.000	0.000	10.605	10.604	10.605	0.000		X/R Ratio
	-86.3	0.0	0.0	-86.3	153.7	33.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-1	0.4kV BUS-A	1.341	0.000	0.000	1.341	1.341	1.341	0.000	Magnitude
		82.5	0.0	0.0	82.5	-37.5	-157.5	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-1	0.4kV BUS-A	2	16.409	0.000	0.000	16.409	16.409	16.409	0.000	Magnitude
			97.4	0.0	0.0	97.4	-22.6	-142.6	0.0	Angle (deg)

Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-A

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
GLY RBOILER	0.4kV BUS-A	3.450	0.000	0.000	3.450	3.450	3.450	0.000	Magnitude
		-97.8	0.0	0.0	-97.8	142.2	22.2	0.0	Angle (deg)
SUPERHEATER2	0.4kV BUS-A	Machine disconnected.							

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-1	0.4kV BUS-A	22.283	0.000	0.000	22.283	22.283	22.283	0.000	Magnitude
		93.5	0.0	0.0	93.5	-26.5	-146.5	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-1	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-B

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-B	43.352	0.000	0.000	43.352	43.352	43.352	0.000	30.035	Magnitude
	10.605	0.000	0.000	10.605	10.604	10.605	0.000		X/R Ratio
	-86.3	0.0	0.0	-86.3	153.7	33.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-B	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-2	On busbar 0.4kV BUS-B is disconnected.								
CABLE-3	0.4kV BUS-B	3.774	0.000	0.000	3.774	3.774	3.774	0.000	Magnitude
		83.0	0.0	0.0	83.0	-37.0	-157.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-2	0.4kV BUS-B	2	16.409	0.000	0.000	16.409	16.409	16.409	0.000	Magnitude
			97.4	0.0	0.0	97.4	-22.6	-142.6	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-B

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
SUPERHEATER1	0.4kV BUS-B	2.247	0.000	0.000	2.247	2.247	2.247	0.000	Magnitude
		-98.0	0.0	0.0	-98.0	142.0	22.0	0.0	Angle (deg)

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-1	0.4kV BUS-B	21.069	0.000	0.000	21.069	21.069	21.069	0.000	Magnitude
		-86.0	0.0	0.0	-86.0	154.0	34.0	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-2	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-C

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-C	43.400	0.000	0.000	43.400	43.400	43.400	0.000	30.069	Magnitude
	10.610	0.000	0.000	10.610	10.610	10.611	0.000		X/R Ratio
	-86.3	0.0	0.0	-86.3	153.7	33.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-4	On busbar 0.4kV BUS-C is disconnected.								
CABLE-5	0.4kV BUS-C	3.259	0.000	0.000	3.259	3.259	3.259	0.000	Magnitude
		82.0	0.0	0.0	82.0	-38.0	-158.0	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-3	0.4kV BUS-C	2	16.407	0.000	0.000	16.407	16.407	16.407	0.000	Magnitude
			97.5	0.0	0.0	97.5	-22.5	-142.5	0.0	Angle (deg)

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-C

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-2	0.4kV BUS-C	23.840	0.000	0.000	23.840	23.840	23.840	0.000	Magnitude
		92.7	0.0	0.0	92.7	-27.3	-147.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-3	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor .
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-D

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-D	43.400	0.000	0.000	43.400	43.400	43.400	0.000	30.069	Magnitude
	10.610	0.000	0.000	10.610	10.610	10.611	0.000		X/R Ratio
	-86.3	0.0	0.0	-86.3	153.7	33.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-6	0.4kV BUS-D	2.104	0.000	0.000	2.104	2.104	2.104	0.000	Magnitude
		82.2	0.0	0.0	82.2	-37.8	-157.8	0.0	Angle (deg)

TRANSFORMER CURRENTS

Tx ID	Bus No	Wnd No	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
TF-4	0.4kV BUS-D	2	16.407	0.000	0.000	16.407	16.407	16.407	0.000	Magnitude
			97.5	0.0	0.0	97.5	-22.5	-142.5	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-D

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
ACB-2	0.4kV BUS-D	19.567	0.000	0.000	19.567	19.567	19.567	0.000	Magnitude
		-85.1	0.0	0.0	-85.1	154.9	34.9	0.0	Angle (deg)
BUS SECTION	0.4kV BUS-D	5.505	0.000	0.000	5.505	5.505	5.505	0.000	Magnitude
		82.7	0.0	0.0	82.7	-37.3	-157.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Winding 2 of Transformer with ID TF-4	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-E

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
0.4kV BUS-E	43.400	0.000	0.000	43.400	43.400	43.400	0.000	30.069	Magnitude
	10.610	0.000	0.000	10.610	10.610	10.611	0.000		X/R Ratio
	-86.3	0.0	0.0	-86.3	153.7	33.7	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
0.4kV BUS-E	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-7	0.4kV BUS-E	3.180	0.000	0.000	3.180	3.180	3.180	0.000	Magnitude
		82.6	0.0	0.0	82.6	-37.4	-157.4	0.0	Angle (deg)
CABLE-8	0.4kV BUS-E	2.325	0.000	0.000	2.325	2.325	2.325	0.000	Magnitude
		82.8	0.0	0.0	82.8	-37.2	-157.2	0.0	Angle (deg)

SYNCHRONOUS MACHINE CURRENTS

SM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
EDG	0.4kV BUS-E	Machine disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar 0.4kV BUS-E

BUS SECTION CURRENTS

Bus ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
BUS SECTION	0.4kV BUS-E	38.012	0.000	0.000	38.012	38.012	38.012	0.000	Magnitude
		-84.7	0.0	0.0	-84.7	155.3	35.3	0.0	Angle (deg)

NEUTRAL EARTHING VOLTAGES & CURRENTS

Parent ID	Vres(kV)	Ires(kA)	
Synchronous Machine with ID EDG	0.000	0.000	Magnitude
	0.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0

Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor

Network Name : SUMANDAK Phase 2_070507

Data State Name : SUPG-B_SCN2

Study Name : Three phase fault at busbar MCC-1

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-1	43.222	0.000	0.000	43.222	43.222	43.222	0.000	29.945	Magnitude
	10.335	0.000	0.000	10.335	10.334	10.335	0.000		X/R Ratio
	-86.1	0.0	0.0	-86.1	153.9	33.9	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-1	MCC-1	41.908	0.000	0.000	41.908	41.908	41.908	0.000	Magnitude
		94.2	0.0	0.0	94.2	-25.8	-145.8	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
COMP TRAIN-A	MCC-1	1.341	0.000	0.000	1.341	1.341	1.341	0.000	Magnitude
		-97.5	0.0	0.0	-97.5	142.5	22.5	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.Q. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar MCC-3

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-3	43.236	0.000	0.000	43.236	43.236	43.236	0.000	29.955	Magnitude
	10.371	0.000	0.000	10.371	10.370	10.372	0.000		X/R Ratio
	-86.1	0.0	0.0	-86.1	153.9	33.9	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-3	MCC-3	39.536	0.000	0.000	39.536	39.536	39.536	0.000	Magnitude
		94.9	0.0	0.0	94.9	-25.1	-145.1	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
NORM PRCS LD	MCC-3	3.775	0.000	0.000	3.775	3.775	3.775	0.000	Magnitude
		-97.0	0.0	0.0	-97.0	143.0	23.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar MCC-2

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	10.335	0.000	0.000	10.335	10.334	10.335	0.000		X/R Ratio
	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
CABLE-2	On busbar MCC-2	is disconnected.						

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
COMP TRAIN-B	MCC-2	Machine disconnected.						

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar MCC-5

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-5	43.281	0.000	0.000	43.281	43.281	43.281	0.000	29.986	Magnitude
	10.368	0.000	0.000	10.368	10.368	10.369	0.000		X/R Ratio
	-86.2	0.0	0.0	-86.2	153.8	33.8	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
CABLE-5	MCC-5	40.097	0.000	0.000	40.097	40.097	40.097	0.000	Magnitude
		94.8	0.0	0.0	94.8	-25.2	-145.2	0.0	Angle (deg)

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	
NORM PRCS LD	MCC-5	3.260	0.000	0.000	3.260	3.260	3.260	0.000	Magnitude
		-98.0	0.0	0.0	-98.0	142.0	22.0	0.0	Angle (deg)

ERACS Fault module By ERA Technology Ltd. ERACS Version: 3.5.0. Fault Version: 3.5.0
Run on 07-May-2007 by Supervisor from data set up on 07-May-2007 by Supervisor
Network Name : SUMANDAK Phase 2_070507
Data State Name : SUPG-B_SCN2
Study Name : Three phase fault at busbar MCC-4

FAULT CURRENTS

Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)	MVA	
MCC-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	10.371	0.000	0.000	10.371	10.370	10.372	0.000		X/R Ratio
	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Angle (deg)

BUSBAR VOLTAGES

Bus ID	Vp(kV)	Vn(kV)	Vz(kV)	Vr(kV)	Vy(kV)	Vb(kV)	Vres(kV)	
MCC-4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Magnitude
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Angle (deg)

CABLE CURRENTS

Cable ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
CABLE-4	On busbar MCC-4	is disconnected.						

INDUCTION MACHINE CURRENTS

IM ID	Bus ID	Ip(kA)	In(kA)	Iz(kA)	Ir(kA)	Iy(kA)	Ib(kA)	Ires(kA)
COMP TRAIN-C	MCC-4	Machine disconnected.						